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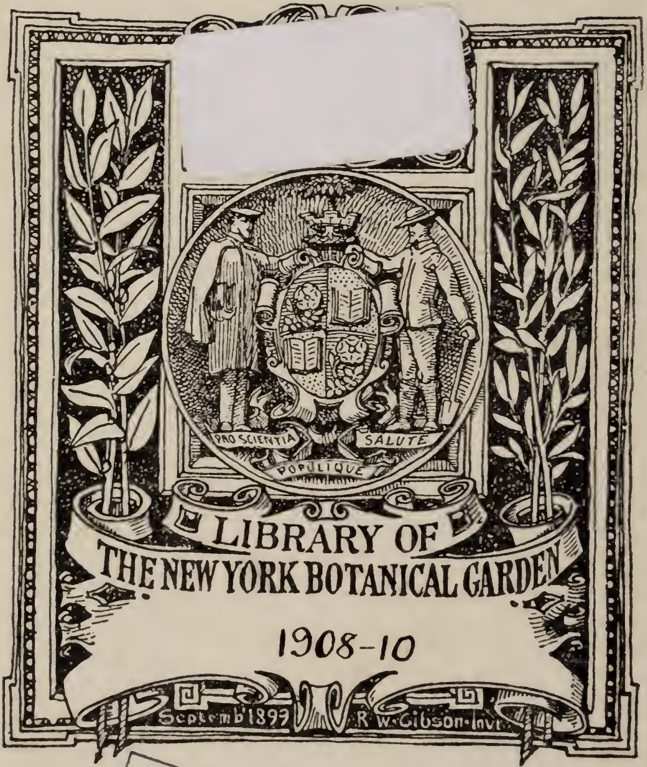

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BULLETIN

OF

The New York Botanical Garden

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VOLUME VI.

WITH 10 PLATES

1908-1910

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BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

VOLUME VI, 1908–1910

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TABLE OF CONTENTS

NO. 19. FEBRUARY 24, 1908

PAGE
REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1907 1
Report of the First Assistant 22
Report of the Head Gardener 29
Report of the Head Curator of the Museums and Herbarium 37
Report of the Director of the Laboratories . . 42
Report of the Librarian 51
Report of the Honorary Curator of the Economic Collections 74
Report of the Superintendent of Grounds . . . 77
REPORT OF THE CHAIRMAN OF THE BOARD OF SCIENTIFIC DIRECTORS FOR 1907 82
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS, AND MEMBERS 87
SCHEDULE OF EXPENDITURES DURING 1907 . . . 103
REPORT OF THE TREASURER 111

NO. 20. MARCH 23, 1909

PAGE
REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1908 115
Report of the Assistant Director 137
Report of the Head Curator of the Museums and Herbarium 148
Report of the Honorary Curator of the Economic Collections 153
Report of the Director of the Laboratories . . 157
Report of the Librarian 164
Report of the Head Gardener 187
Report of the Superintendent of Grounds . . . 195
SCHEDULE OF EXPENDITURES DURING 1908 . . . 201

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS, AND MEMBERS 208
REPORT OF THE TREASURER 223

NO. 21. SEPTEMBER 27, 1910

PAGE

BOTANICAL CONTRIBUTIONS:

Bolivian Mosses. Part II, by R. S. WILLIAMS. [*Issued separately, October, 1909.*] 227
Critical Notes on New or Little Known Species in the Herbarium of the New York Botanical Graden, by B. P. G. HOCHREUTINER. [*Issued separately, April, 15, 1910.*] 262
A Phytogeographic and Taxonomic Study of the Southern California Trees and Shrubs, by LEROY ABRAMS. [*Issued separately, September 27, 1910.*] 300

NO. 22. NOVEMBER 30, 1910

PAGE

BOTANICAL CONTRIBUTIONS:

New Species from Bolivia, Collected by R. S. Williams—I, by HENRY H. RUSBY. [*Issued separately, November, 1910.*] 487
GENERAL INDEX 518
GENERIC INDEX 524

VOL. 6 NO. 19

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED FEBRUARY 24, 1908]

CONTENTS:

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1907, ... 1
Report of the First Assistant, ... 22
Report of the Head Gardener, ... 29
Report of the Head Curator of the Museums and Herbarium 37
Report of the Director of the Laboratories, . . . 42
Report of the Librarian, ... 51
Report of the Honorary Curator of the Economic Collections, ... 74
Report of the Superintendent of Grounds, . . . 77
REPORT OF THE CHAIRMAN OF THE BOARD OF SCIENTIFIC DIRECTORS FOR 1907, ... 82
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS, AND MEMBERS, ... 87
SCHEDULE OF EXPENDITURES DURING 1907, ... 103
REPORT OF THE TREASURER, ... 111

No. 18, completing vol. 5 of this BULLETIN, has not been published.

BULLETIN

OF

The New York Botanical Garden

Vol. 6. No. 19.

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1907

(*Accepted and ordered printed January 13, 1908*)

To the Board of Managers of the New York Botanical Garden.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 13, 1908:

Progress in the development of all departments of the Garden has been made during the year. A large amount of additional construction work has been accomplished by means of an appropriation for that purpose made by the city in the spring. The collections have been considerably increased, mainly by gifts, and by the plants and specimens obtained by explorations in tropical America, aided by gifts of money by members of the Board of Managers and other friends of the Garden. The labeling of collections has been brought to a very efficient stage and the educational work of the institution has been expanded. The number of visitors continues to increase. The permanent funds of the Garden have received only slight additions by life membership fees, students' fees, and contributions to the Endowment Fund, aggregating about one thousand dollars. The value of gifts of living plants, specimens and books aggregates $11,063.90; these gifts have been recorded in the monthly Journal. The general maintenance of the Garden has been accomplished by the city appropriation of $75,000, supplemented by part of a special appropriation of $13,000 made by the Board of Managers for this purpose. The necessity for making this appropriation seriously diminished our ability for purchasing desirable plants, specimens and collections.

The total membership of the Garden is now 1,167.

Construction of Roads and Paths

The river road extending from the east end of the Long Bridge northwardly along the east side of the Bronx River to the Newell Avenue entrance, on which work has been prosecuted at intervals for several years, was completed and thrown open for use in November, completing the driveway system in the northeastern part of the grounds; this road has a total length of a little over 2,000 feet and forms a noteworthy addition to the driveway system.

The main driveway at the Lake Bridge, which has been unfinished since the completion of that structure two years ago, was paved and surfaced during the autumn, thus completing the main north and south driveway through the western part of the grounds.

The road leading from the main driveway near the Bleecker Street entrance on the east side of the grounds to the new public conservatories now under construction, was graded and nearly all the telford foundation laid during the year; its completion requires broken trap rock and screenings.

A beginning was made in grading the portion of the main driveway still to be constructed from a point near the Bleecker Street entrance to the southeastern corner of the grounds, in accordance with the original plan, and stone for the telford foundation of a part of this road is being assembled during the winter, taken from the quarry behind the museum building. This is now the only remaining portion of the driveway system to be built, a total length of 1,800 feet.

The construction of the path system has been continued at a number of different points and much progress has been made. The paths about the lakes north and east of the museum building, and those on the fruticetum plain, partially built in preceding years, were completed. The paths leading from the museum building and the herbaceous grounds through the economic garden and adjoining areas were completely built; the path leading from the herbaceous garden southward through the woods to the Bronx Park entrance, partially constructed in preceding years, was also completed. A commencement was made in the construction of paths leading from the Long Bridge eastwardly toward the new public conservatories, and in those leading from the fruticetum, northwardly through the north meadows to the upper driveway bridge.

The total length of paths built and completed during the year is about 9,000 feet.

Through the coöperation of the Department of Parks all the previously constructed driveways and paths that needed resurfacing were covered with a thin layer of trap rock screenings during the autumn and thoroughly rolled, the entire driveway and path system, so far as constructed, being now in excellent condition, except at a very few points where slight repairs and small amounts of additional construction are necessary.

It is very desirable that the work of path building be continued during the next year in the eastern part of the grounds in order to connect the new public conservatories with the bridges over the Bronx River.

Bridges

The bridge for pedestrians, built of rounded boulders, taken mainly from old stone walls, replacing the old wooden "Blue Bridge" at the northern end of the Hemlock Forest, on which preliminary work was accomplished late in 1906 under the contract of the Park Department with Mr. M. J. Leahy, was completed in September. This construction performed the double work of providing a unique permanent bridge and of clearing the grounds of boulders. The path approach to its western end had been previously built, and a temporary path approach to its eastern end has been made.

The three driveway bridges built in previous years have required no repairs. The concrete and cement sidewalks of the Lake Bridge were built in September. The permanent sidewalks for the Long Bridge and for the Upper Bridge still remain to be constructed.

During the year considerable study was given to plans for the bridge proposed by the Commissioner of Parks to replace the wooden foot bridge south of the waterfall near the Lorillard Mansion, for which an appropriation had been voted by the Board of Estimate and Apportionment to the Park Department. The western end of this bridge will stand on land within the Garden reservation, its eastern end on land of the Park Department. The plans for this structure have not yet been brought to completion. It is very desirable that this bridge should be built, inasmuch as the present wooden bridge below the waterfall is much too narrow for the accommodation of crowds of visitors and it is approached only by steep descents at either end.

Grading

Continued progress has been made during the year in excavating earth and rock at the rear of the museum building, all the excavated material having been used for filling at various parts of the grounds or for the telford foundation of driveways and paths, and the work is progressing during the winter. Much still remains to be done at this point in order to establish the grades called for in the general plan, but inasmuch as all the earth and rock are needed for filling or for road and path building, double work is continuously being accomplished. It is estimated that enough rock and earth to nearly or quite complete the road and path system remains. It will be possible in the spring to bring nearly an acre of the area behind the museum building to finished lawn.

The filling and grading required at both ends of the Lake Bridge and at both ends of the Long Bridge was completed during the season. Considerable progress has been made in filling low places in the north meadows while building paths in that part of the grounds.

Much additional grading was done along the river road and along the road leading to the new public conservatories.

In the herbaceous grounds the sides of the brook which runs north and south through the middle of the valley were regraded and the brook edges stoned up, greatly improving the valley. The topsoil needed for these grading operations has all been obtained by carefully stripping and saving it from the lines of paths and roads.

Drainage

Accompanying the construction of roads and paths, additional catch-basins with drain-pipe connections have been constructed, and the system of grass gutters along the driveways has been continued. The overflow from the bronze fountain in front of the museum building, which was temporarily discharged into one of the sewers and thus wasted, was turned into the drain system which empties into the upper lake, by means of a drain-pipe connection about 400 feet long under the lawn south of the museum building; this waste water has kept the upper lake at overflow throughout the season, although the fountain has been played only about ten hours a day.

During grading work in the herbaceous garden and in the establishment of the aquatic system in the economic garden, several hundred feet of tile drain were used, much improving the drainage of that valley.

At the power-house of the new conservatories a 12-inch vitrified tile drain was laid for a distance of about 150 feet, passing under the floor of that building; as the construction work proceeds at this point much additional drain-pipe will have to be laid, inasmuch as the excavations for the cellars both of the power-house and of three of the greenhouses have shown the existence of springs.

In my last annual report I referred to the desirability of lowering the dam in the Bronx river at the Lorillard mansion an additional 8 inches, 16 inches having been taken from it in the summer of 1902. This has not been done, owing to the pressure of more important work, but it is still desirable, in order to improve the drainage of the north meadows.

Water Supply

The 6-inch main along the north and south driveway east of the Bronx river was tapped at a point north of the lake bridge, about 1,500 feet of 6-inch water-main laid from that point along the south side of the east and west driveway, extending to the plaza near the Bleecker street entrance; from this point a 4-inch water-main was laid along the east side of the driveway approach to the new public conservatories, a distance of about 900 feet, thus furnishing water supply at these buildings. A 1-inch galvanized iron water-pipe was laid from near the New York Central Railroad station, a distance of about 500 feet parallel with the railway to the Mosholu parkway approach, in order to supply facilities for watering the steep driveway at this point, which proved inconvenient for the watering-carts. About 400 feet of 1-inch pipe was laid in the Economic Garden.

It is very desirable that the water-supply system should be extended as rapidly as possible, in accordance with the general plan. About one-half of the 6-inch and 4-inch main planned for the grounds has been laid from time to time along the driveways and paths, so that a good beginning has been made. The driveways have been kept watered by the Park Department whenever watering-carts could be spared from the parkways and other parks, but the service has not been sufficient owing to the very large extent of driveway to be cared for in the park system of the Bronx. The method of watering Telford-Macadam roads by watering-carts is not an economical one, because it requires a large number of men and horses which are not continuously occupied; very often in rainy weather during the summer the roads require no water for several days at a time, and again in dry weather they require almost continuous sprinkling in order to keep the surface in good order.

In the original plan for the water-supply system as described in the report of the Plans Commission of the Garden * it was recommended: "All these pipes are located along the proposed roads, rather than under them; they are so arranged that hydrants can be placed along the roadsides at intervals, so that by using hose any parts of the roads, walks and plantations can be reached."

After a careful study of the method by watering-carts I am convinced that this method of watering the roads and walks by hose would save much money and be far more efficient. In order to bring it into operation for the Garden grounds about 6,000 feet of 6-inch cast-iron water-pipe and 3,000 feet of water-pipe of smaller diameters, together with hose-taps at intervals of about 150 feet, are required.

Buildings

A contract for the construction of the boiler house and the subway connecting this house with the new public conservatories was awarded early in the year by the Park Department to the firm of Kelly and Kelley and work was begun in the spring. These structures are now nearly completed, the cost being $25,600.

Another contract awarded by the Park Department to the same firm during the summer provides for the construction of five of the glass houses, costing $62,796; during the autumn the excavations for cellars for these buildings were made and the foundation walls partly constructed. Both these contracts will presumably be completed by midsummer so that the five new greenhouses will be ready for use at that time; they will supply a much needed relief to the crowded condition of the first range of public conservatories, and as soon as they are completed the necessary grading in the vicinity can be taken up. As already stated, the driveway and path approaches to these buildings have been partially built, and a water-main laid for their supply.

Accounts of the maintenance and repairs of buildings will be found in the report of the First Assistant and in that of the Superintendent of Grounds, hereto appended.

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* Bull. N. Y. Bot. Gard. 1: 43.

Boundary Fences

In the autumn a contract was awarded by the Commissioner of Parks to Guidone and Galardi for the construction of a boundary wall and fence along the property line of Fordham University, extending from the Elevated Railway Station on the west to the Southern Boulevard entrance on the east, a distance of about 2,000 feet, the contract price being $17,000. Surveys for the location of this fence were carefully made by the Park Department and construction work may be commenced in the spring. The design of this wall and fence was duly approved by the Board of Managers, after slight modification by the Commissioner of Parks for the Borough of the Bronx. It is desirable that other portions of the boundary of the garden be permanently fenced, the line along the right-of-way of the New York Central and Hudson River Railroad Company being the next most important to be secured. It will probably be unnecessary to fence the eastern and northern boundaries for several years.

Telephone Service.

The museum building, the first range of public conservatories, and the power house at the Bedford Park Avenue entrance, are connected by telephone cables through the subways containing the steam-pipes, the cables having been put in during the construction of these subways. The museum building is connected with the stable and with the propagating houses by an underground cable laid along the paths crossing the river at the Boulder Bridge. Previous to the construction of this bridge the wire passed under the river, but upon the completion of the Boulder Bridge it has been carried over that structure. The construction of the new public conservatories and power house required an elaboration of the telephone service and this was supplied during the summer by laying an 8-wire lead-covered cable underground from the museum building, crossing the Lake Bridge and the Long Bridge, to a point at the plaza near the Bleecker Street entrance; from this point a 4-wire lead-covered cable was laid underground along the driveway approach to the new conservatory; these cables were mostly laid in the water-main trenches before closing them; to complete the system it is still necessary to connect the stable and propagating houses with the end of the 8-wire cable in this plaza, and dispense with a portion of the wire previously laid. We shall thus have all buildings connected by underground cables. The museum building has long been connected by underground cable with the public telephone system of the city. The Telephone Company has recommended to me that a public telephone booth be provided in the museum building and I regard this as desirable; I recommend that the Garden's telephone system be brought to such a central booth when completely established and that all telephonic service be put in charge of an aid who will also be assigned the sale of guide books and photographs.

Plants and Planting

Planting was carried on at various parts of the grounds during the spring and fall, taking advantage of the large amount of additional land prepared for it during the past two years, as recorded in detail by the Head Gardener in his report hereto appended. This work included the completion of the west border along the New York Central and Hudson River Railroad, which was broken by the construction of the approaches to the Mosholu Parkway and to the Woodlawn Road, and the filling in of the gap near the west end of the upper lake; the completion of the planting of the economic garden in the glade southeast of the museum building; the planting of flower gardens in the rectangular plots at the north side of the first range of public conservatories, and increasing the systematic collections in the herbaceous grounds, the fruticetum, the pinetum and the arboretum, together with the establishment of decorative groups of shrubs at several points.

It is desirable during the coming year to continue planting operations in accordance with the general plan, both by increasing the systematic collections and by additional planting of trees and shrubs along the driveways and paths in ground already prepared. Continued attention has been given to the labeling of the systematic collections both in the conservatories and out-of-doors, about 3800 painted labels having been made during the year. This continued progress in the labeling of the collections is most satisfactory and by carrying it along at the same rate of progress during the next year, a very large proportion of the specimen plants will be provided with labels.

The Hemlock Grove

I have suggested in two previous annual reports that it would become necessary, in order to insure the safety of the hemlock forest, to restrict its use by visitors to certain well-defined trails or paths, inasmuch as the indiscriminate trampling of the thin soil by crowds of people would in the end be dangerous to the hemlock spruces. Up to the present time no serious damage has ensued, but the increasing number of visitors in summer and the impossibility of restraining general picnicing, have made it quite apparent that the trails should be indicated and fenced; this fencing would keep the great majority of visitors within the lines of the trails. The character of this fencing has been given very careful attention; it is necessary to preserve the general sylvan aspect of the forest, so that no formal fence lines are permissible, and after much consideration I now recommend that the trails be given an average width of about 12 feet and fenced on both sides by locust posts, 2½ to 3 feet high above ground, surmounted by a single split red cedar rail, the two to be spiked together; this method of construction would supply an ordi nary fence such as might frequently be seen in woodlands, with this construction in mind a large number of dead and dying locust trees have been cut from the grounds in preceding years and the trunks stacked, and a large number of dead and dying red cedars have also been cut out and the trunks reserved, so that material is at hand for a considerable portion of this necessary fencing.

As recorded by Dr. Murrill, in his report as First Assistant, the chestnut trees, both within the hemlock forest and at other points within the grounds, have been decimated by the ravages of the chestnut fungus, which it has been impossible to combat; a large number of these dead trees were removed during the early part of the year and others should be cut down within the next few months. In accordance with the terms of the agreement with the Park Department relative to the hemlock grove, the cutting out of any trees within the grove has been under the observation of an official of the Park Department detailed for this duty.

Museums

Detailed accounts of additions to the public museums and of additional cases constructed during the year, will be found in the reports of the Head Curator of the Museum and Herbarium and of the Honorary Curator of Economic Collections, hereto appended. The general plan of work has been the same as in preceding years, looking toward the more complete and satisfactory illustration of the various groups of objects, by the addition of fruits, seeds, barks, woods, and other products, and of photographs and other illustrations. Continued attention has also been given to the labelling of the collections.

The addition of six large floor cases in the basement of the museum hall permits the display of a large number of additional specimens of fossil plants which have been held in storage, and this installation is now in progress.

A large number of photographs illustrating various phases of plant life have been accumulated which it is desirable to frame and hang on the museum walls and it is hoped that some progress may be made with this work during the year.

Herbarium

The development of the collection of dried specimens has been continued, the additions to this collection aggregating about 49,000 specimens, partly received in previous years and partly obtained during 1907. Much time has been given by the curators to the accurate naming and classification of the herbarium, which is being more and more consulted by curators from other institutions and by students from all parts of the country.

The very important collection of fungi of the herbarium was rearranged and installed in new herbarium cases in the large room at the west end of the upper floor of the museum building, which has hitherto been used for miscellaneous purposes, thus leaving much additional space for the collection of ferns, mosses and lichens, in the rooms east of the library. Some additional assistance in mounting and distributing specimens, obtained by gift, purchase, or exchange, which have accumulated in the storerooms, is very desirable during the coming year, in order that this material may be made available for students and investigators.

Library

The use of the library by students and visitors is increasing as the collection becomes more complete. 592 volumes were added during the year, obtained by purchase and by gift, the total number of volumes being now 20,458, as appears in the report of the librarian, hereto appended. The endeavor to secure the older literature of botany, systematically commenced two years ago, has been continued, and many important works now difficult to obtain have been added. As pointed out in previous reports, this literature is continually becoming scarcer, owing to the largely increased number of libraries throughout the world, and it is therefore highly important that the effort should be continued, and funds are desired for this purpose. During the year a contribution of $100, from Mr. E. S. Harkness, was credited to the Special Book Fund.

The position of librarian, held by Miss Anna Murray Vail since 1899, became vacant in October by her resignation, which was received with much regret. Dr. John Hendley Barnhart was appointed librarian at that time.

Space for the additional books secured during the year was obtained by adding new shelves to the steel cases already constructed, no additional cases having been required. The number of institutions now on our exchange list for publications of the Garden is about 600, as against 570 recorded in my last annual report. The monetary value of the publications which we annually receive in exchange is about $850.

Laboratories

The laboratories have been used by many students pursuing special investigations during the year, as detailed in the report of the Director of the Laboratories, hereto appended. No considerable changes have been made in the equipment, though some rearrangements of furniture and fixings have been found desirable.

In my last annual report I recorded an inquiry made of a number of universities, gardens and museums, relative to proposed coöperation in developing the tropical laboratory of the Garden at Cinchona, Jamaica, looking toward the possible establishment of a resident investigator at that station. It was proposed by representatives of some institutions that this be accomplished by the contribution of $100 a year by fifteen or twenty universities, museums or gardens. I have to report that this movement was not successful, only five institutions finding themselves able to join in the proposed work, although the movement was most cordially approved. The buildings at Cinchona were somewhat seriously damaged by the earthquake which devastated the city of Kingston last January, but they have been put in complete repair by the Jamaica Government without expense to the Garden, and students may now be received there as formerly. There is no doubt that this station provides exceptional facilities for investigations of tropical and subtropical plants, and that important additions to knowledge would be made by the residence there of a trained investigator.

Lectures and Demonstrations

The public lectures delivered at the museum building on Saturday afternoons during spring and autumn have been continued to appreciative audiences. The time for the lecture was changed from 4:30 to 4 o'clock. Consideration has been given to the desirability of extending these lectures into the summer months, but this has not been attempted as yet. It does not seem probable that audiences could be assembled for such lectures during the winter, but a course of summer lectures might prove desirable.

The lectures and demonstrations to children and teachers of the public school in coöperation with their nature studies, were continued during the spring from April 19 to June 4, in coöperation with the principals and district superintendents of the Borough of the Bronx, and of the upper school districts of Manhattan. The attendance of children and students was quite as large as during the preceding course. In order to give more official recognition of this coöperation, the school principals of the Bronx have recommended that the arrangements for selecting and sending children to the Garden be taken up directly by the Board of Education, and, pending a decision on this question, no lectures nor demonstrations were arranged during the autumn. The matter was referred by the Board of Education to the Board of District Superintendents and it is hoped that this important work may be further elaborated during the coming spring.

Details of lectures and demonstrations and of meetings held at the Garden during the year will be found in the report of the First Assistant, hereto appended.

Guides and Guide-Books

The arrangements for the personal guidance of visitors through the grounds and buildings made last year were continued and have been much appreciated by those who have taken advantage of them. The total number of persons escorted in this way has not been very large, but it is no doubt desirable to continue this work.

The guide-book, issued late last year, was placed on sale at the museum building and at the approach to the elevated railway station, together with selected photographs of special features, other publications of the Garden, and specially prepared postal cards.

Exploration

By means of a small appropriation from general funds and of special contributions for the purpose, botanical exploration and collecting has been prosecuted in the West Indies to the great advantage of the collections of living plants and of the museums and herbarium.

Contributions credited to the special exploration fund were received as follows:

D. O. Mills	$1,500
Field Museum of Natural History, advance on account of Exploration of the Bahamas	250
Morris K. Jesup	100
S. S. Palmer	100
Samuel Sloan	100
F. T. Van Beuren	50
Bradley Martin	50
O. H. Kahn	50
John E. Parsons	50
James Douglas	50
W. Bayard Cutting	50
James A. Scrymser	50
James B. Ford	50
George C. Thomas	25
Anonymous	25
John H. Bloodgood	10

Dr. Marshall A. Howe, a Museum Curator, spent parts of December, 1906, and January, 1907, on the island of Jamaica making collections and field studies of marine algae, in continuation of his previous investigations of these plants. The continuation of the exploration of the Bahama Islands was accomplished in coöperation with the Field Museum of Natural History of Chicago, by Dr. C. F. Millspaugh, Curator of Botany of that institution, and myself, in an expedition to the eastern islands of that archipelago during February and March, and during November and December this work was further continued by Dr. Marshall A. Howe and Mr. Percy Wilson, Administrative Assistant, in an expedition to the southeastern islands, a region hitherto quite unknown botanically; they returned to the Garden on January 5, bringing back very large collections both of land plants and of marine algae, and this expedition will essentially complete the survey of that archipelago, which has extended over several years. The island of Montserrat, British West Indies, was explored by Dr. John A. Shafer, Museum Custodian, during January and February, and this trip yielded important additions to the museum and herbarium. The exploration of the island of Jamaica was continued by Mrs. Britton and myself during September, in coöperation with the Department of Public Gardens and Plantations of that island, and important additions to the collections in all departments were obtained. Dr. Arthur Hollick, a Museum Curator, has continued at intervals during the year, the collection of fossil plants from the Cretaceous formation of the Atlantic coastal plain, special attention having been given by him, in coöperation with Professor E. C. Jeffrey, of Harvard University, to the lignitic deposits at Kreischerville, Staten Island, which have yielded material shedding much light on the features of the flora of that geologic epoch; the results of these studies will soon be published as Volume 3 of the Garden's Memoirs.

There is no doubt that exploration carried on either by members of the staff or by trained collectors under their direction, is the most profitable way in which additions can be made to the collections in all departments of the Garden, and it is most desirable that funds be secured to continue this work especially in the West Indies and Central America. An exploration of the republic of Panama, in continuation of some work done there by Mr. John F. Cowell, Director of the Buffalo Botanic Garden, on behalf of the New York Botanical Garden, in 1905, has been arranged for by the kind generosity of Mr. D. O. Mills, President of the Garden, and Mr. R. S. Williams has been detailed for this work, to leave the Garden during January for an absence of about four months. It is much desired that expeditions to eastern Cuba, Jamaica and Santo Domingo, be provided for during the year.

Investigations

The collections of living plants, and of museum and herbarium specimens, have afforded increased facilities for investigations by students, visiting botanists, and members of the staff, and records of work accomplished will be found in the reports of the several officers hereto appended. The appropriation available for resident research scholarships has been expended with advantage, and the annual expenditure of a larger sum than our present income affords would be most desirable. As in previous years, the curators have been able to carry on some original investigation, largely, however, during time outside of their regular hours of attendance, the care, study and naming of the constantly increasing collections requiring most of their required time. Visits have been made by various members of the staff to other museums and herbaria in the United States in order that we should be kept informed of progress at these institutions, and for the determination of questions for which our own collections and library were insufficient. An account of publications issued by the Garden during the year will be found in the report of the First Assistant, hereto appended. These publications have been made possible largely by the aid of the David Lydig Fund, bequeathed by the late Judge Charles P. Daly.

Research Scholarships

Professor J. C. Arthur, of Purdue University, and his assistant, Mr. Frank D. Kern, were awarded scholarships for one month each, in January, to aid them in their investigations of the North American species of rusts (Uredinales), a group of parasitic fungi of immense importance in agriculture and horticulture. Their first contribution to the "North American

Flora" appeared March 6, 1907, as part 2 of volume 7, and their recent investigations are embodied in a succeeding part soon to be published.

Miss Mary Perle Anderson, who held a scholarship from January 1 to April 1, 1907, is studying the Geographical Distribution of the Ferns of Japan. Miss Anderson spent some time during the summer in consulting material in European herbaria.

Professor Melville Thurston Cook, formerly Chief of the Department of Plant Pathology of the Estación Central Agronómica de Cuba, was granted a scholarship from January 1 to April 1, 1907. He was engaged in studies of insect galls and in embryological investigation. While here he completed two papers, "The Embryology of *Rhytidophyllum*," and "The Embryology of *Rhizophora Mangle*," both of which appeared in The Bulletin of the Torrey Botanical Club for 1907. At the termination of his residence at the Garden, Dr. Cook accepted an appointment under the Adams Act, as Plant Pathologist of the Delaware Agricultural Experiment Station at Newark, Delaware.

Dr. Raymond Haynes Pond held a research scholarship from October 1, 1906, to April 1, 1907, and, on account of the nature of the problems, the grant was continued from April 1, 1907, to July 1, 1907. Dr. Pond investigated the problem of "Solution Tension and Toxicity in Lipolysis," and has published one paper on this subject in the American Journal of Physiology for July, 1907. A second paper has also been prepared.

Professor F. S. Earle, of Herradura, Cuba, formerly Director of the Estación Central Agronómica de Cuba, held a research scholarship during July, during which time he was investigating certain groups of the gill-fungi with a view to publishing them at an early date in the "North American Flora." Professor Earle has made important additions to the knowledge of the gill-fungi through his recent collections in Cuba.

Preservation of Native Plants

A grant of $200 from the income of the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants, was made in the spring to Mr. Charles Louis Pollard, Secretary and Treasurer of the Wild Flower Preservation Society of America, to enable him to deliver a series of illustrated lectures in ten cities and towns in New Jersey, New England and Canada, his illustrations being mainly drawn from the Van Brunt collection of colored lantern slides, the property of the Garden. Mr. Pollard has published an account of these lectures in the August issue of our JOURNAL, and there is no doubt that much interest in the subject was aroused by them.

Administrative

The detailed oversight of the maintenance of grounds, buildings, collections and plantations, has been ably accomplished by Dr. William A. Murrill, First Assistant, who has also been entrusted with the direction of the Garden at intervals during my absence from New York. As recommended by the Scientific Directors, the Board of Managers at their October meeting re-established the position of Assistant Director, and Dr. Murrill has been appointed to that post. Mr. Percy Wilson, Administrative Assistant, has continued in this capacity throughout the year, acting immediately under my own instructions and those of Dr. Murrill. My own time has been largely given to the general direction of the work of the institution, to the continuance of construction operations and to the increase of the collections; as much of it as could be spared has been devoted to the study of collections brought in by the several exploring expeditions and to the preparation of manuscript for "North American Flora." I have also completed, with the assistance of Dr. J. A. Shafer, Museum Custodian, a descriptive work on North American trees which will soon be published, and my studies of Cactaceae, in coöperation with Dr. J. N. Rose of the United States National Museum have made progress.

General Considerations

As stated in my last annual report the Garden has now reached the stage of development which should soon cause it to take rank among the most important institutions of its kind. Compared with the sums already expended by the city and by the Board of Managers for construction, relatively small amounts for this purpose are still necessary, including the completion of the new range of public conservatories, commenced during last year, the building of additional roadways and paths, and the necessary grading and drainage work, and the extension of the water supply. The annual allowances for maintenance are, however, as yet insufficient for a wholly successful up-keep of the institution, and it is most desirable that additional funds be procured. This approaching need was recognized by the Finance Committee of the Board of Managers in 1905, and in November of that year an appeal for additional funds was made by that Committee recommending the increase of our endowment to $1,000,000. The matter was again taken up last spring by the Executive Committee of the Board of Managers and the appeal renewed. No considerable immediate results have been reached by either of these efforts, although there is no doubt that much interest has been aroused. The present city maintenance allowance of $75,000 and the Garden's available income from invested funds, membership dues and other sources amounting to about $28,000 provide collectively an income for 1908 of about $103,000. It is estimated that the amount that is yearly needed to provide for a wholly satisfactory maintenance, a proper increase of the collections and the development of educational work is about $125,000. This would be obtained by the increase of the Endowment Fund to $1,000,000, as recommended by the Finance Committee and by the Executive Committee.

Reports Appended

I submit also reports by the First Assistant, the Head Curator of the Museums and Herbarium, the Honorary Curator of the Economic Collections, the Librarian, the Head Gardener, the Superintendent of Grounds, and a schedule of expenditures under appropriations made by the Board of Managers.

Respectfully submitted,
N. L. Britton,
Director-in-Chief.

REPORT OF THE FIRST ASSISTANT

To the Director-in-Chief:

Sir: I have the honor to submit the following report for the year 1907.

Grounds

The roads and paths of the Garden have been cared for as in previous years by employees of the Park Department.

Borders, signs, guard rails, catch basins, water mains, and other matters connected with lines of traffic through the grounds have also received due attention, as detailed in the report of the Superintendent. Considerable pruning has been necessary along the roadways and on some of the paths. This has in every case been done with great care, and the wounds have been covered with coal tar.

The condition of the plantations is given in detail in the report of the Head Gardener. The valley containing the herbaceous grounds, the region about the lakes to the north of the museum building, and the courts of the public conservatories have been much improved during the year. A vigorous war has been waged against the muskrat with great success.

By far the most serious damage that has occurred on the grounds during the year has been due to the ravages of a fungus disease among the chestnut trees, practically all of them having succumbed to its attacks. The well-known leaf blight of the plane-tree was unusually severe the past season, but its effects are not often lasting. The months of July and August were exceedingly dry and vegetation suffered severely, but by continual use of the watering cart the more susceptible plants were kept alive until the copious September rains restored everything to its normal condition. A furious storm in December broke down a few diseased trees in the open and overturned two or three hemlocks on exposed cliffs in the forest, but the hemlock woods as a whole proved to be in excellent condition.

Insect pests have been successfully kept in check by spraying. The lakes were treated twice during the summer with copper sulfate to rid them of algae, the results being most satisfactory. Mosquitoes were less abundant than ever before, on account of the regular use of petroleum in catch basins and other breeding places.

The living collections and wild plants have suffered the usual damage from lawless visitors, but this has not been of a serious nature except in a few instances. Only seventeen arrests were made the past year, as against thirty-five the year previous.

Buildings

Museum

A number of new cases have been installed during the year to accommodate the large accessions to various collections.

Photographs and postal cards of interest to visitors have been placed on sale with the guide-books and certain other Garden publications near the elevated railway entrance and in the Museum building.

The number of visitors has perhaps been larger the past year than during any previous year in the history of the Garden. The holiday crowds are growing larger, the attendance at public lectures is improving, and more botanists are consulting the library and herbarium. The various important meetings held at the Garden also attracted scientific men from many parts of this country and Europe.

Conservatories

The public conservatories are perhaps in a more satisfactory condition than ever before. Considerable painting and repairing has been done both on the outside and inside of the houses. The palms and other tall plants have greatly improved under the new method of watering by means of a force pump. The large collection of cacti placed outside in the conservatory court on the south and the flower garden established on the north side added much to the appearance of the range and attracted a great deal of attention from visitors.

The propagating houses are also in excellent condition. House No. 3 is now devoted to the smaller specimens of the splendid orchid collection recently given by Mr. Oakes Ames, the larger plants being housed at the public conservatories.

OTHER BUILDINGS

The heating and power plant has been maintained in good condition at small expense. No accidents nor irregularities of importance have occurred in this connection.

The stable and stable machinery are in good repair. A new horse for driving has been purchased and the one formerly used has been sold.

Publications

JOURNAL

The Journal has appeared each month during the year, making a volume of 290 pages with 5 plates and 37 figures.

BULLETIN

Bulletin no. 14, by Dr. H. H. Rusby, "An Enumeration of the Plants Collected in Bolivia by Miguel Bang. Part 4. With Descriptions of New Genera and Species," was issued December 7, 1907, and contains 170 pages. It was issued separately in advance, September 5, 1907.

Bulletin no. 17, with 114 pages, was issued March 7, 1907. It contains the annual reports of the Director-in-Chief, First Assistant, Head Curator of the Museums and Herbarium, Honorary Curator of the Economic Collections, Director of the Laboratories, Librarian, Head Gardener, Superintendent of Grounds, Scientific Directors, Committee on patrons, fellows and members, and Treasurer.

CONTRIBUTIONS

Contributions reprinted from various periodicals during the year are as follows:

No. 85. Systematic Palaeontology of the Pleistocene Deposits of Maryland: Pteridophyta and Spermatophyta, by Arthur Hollick.

No. 86. Two New Coralline Algae from Culebra, Porto Rico, by M. Foslie and M. A. Howe.

No. 87. Studies on the Rocky Mountain Flora — XVII, by Per Axel Rydberg.

No. 88. Jane Colden, an early New York Botanist, by Anna Murray Vail.

No. 89. Two New Species of Aytonia from Jamaica, by Caroline Coventry Haynes.

No. 90. Studies in North American Peronosporales — I. The Genus Albugo, by Guy West Wilson.

No. 91. Costa Rican Orchids — I, by George Valentine Nash.

No. 92. An Occurrence of Glands in the Embryo of *Zea Mays*, by C. Stuart Gager.

No. 93. American Fossil Mosses with Description of a New Species from Florissant, Colorado, by Elizabeth G. Britton and Arthur Hollick.

No. 94. Solution Tension and Toxicity in Lipolysis, by Raymond H. Pond.

No. 95. Studies in North American Peronosporales — II. Phytophthoreae and Rhysotheceae, by Guy West Wilson.

No. 96. Studies on the Rocky Mountain Flora — XVIII, by Per Axel Rydberg.

No. 97. The Sedges of Jamaica, by N. L. Britton.

No. 98. The Genus Antrophyum — I. Synopsis of Subgenera, and the American Species, by Ralph Curtiss Benedict.

No. 99. Some Philippine Polyporaceae, by William Alphonso Murrill.

North American Flora

The North American Flora, designed to include descriptions of all known plants native to North America, Central America and the West Indies, is being issued in parts at irregular intervals as rapidly as these parts can be prepared.

Vol. 7, part 2, containing descriptions of the families Coleosporiaceae, Uredinaceae and Aecidiaceae (pars), by J. C. Arthur, was issued March 6, 1907.

Vol. 25, part 1, containing descriptions of the family Geraniaceae by Miss L. T. Hanks and J. K. Small, the Oxalidaceae and Linaceae by J. K. Small, and the Erythroxylaceae by N. L. Britton, was issued August 24, 1907.

Vol. 9, part 1, containing descriptions of the Polyporaceae (pars), by W. A. Murrill, was issued December 19, 1907.

Lectures

PUBLIC LECTURES

Two series of lectures have been delivered to the general public on Saturday afternoons, one in the spring and one in the autumn. These lectures were as follows:

April 27. "The Life Story of a Tree," by Dr. C. Stuart Gager.

May 4. "The Flowers of Trees and Shrubs Growing Wild near New York City," by Dr. N. L. Britton.

May 11. "Jamaica: Its Flora, Scenery and Recent Disaster," by Dr. M. A. Howe.

May 18. "Water Lilies and other Aquatic Plants; their Relation to Horticulture," by Mr. G. V. Nash.

May 25. "The Influence of Vegetation in the Formation of Recent and Ancient Swamps," by Dr. Arthur Hollick.

June 1. "Some Little Known Edible Fruits of the United States," by Dr. H. H. Rusby.

October 5. "The Salton Sea and its Effect on Vegetation," by Dr. D. T. MacDougal.

October 12. "Collecting Fungi in the Wilds of Maine," by Dr. W. A. Murrill.

October 19. "The Forms and Functions of Leaves," by Dr. C. Stuart Gager.

October 26. "The True Grasses and their Uses," by Mr. George V. Nash.

November 2. "The Giant Trees of California: their Past History and Present Condition," by Dr. Arthur Hollick.

November 9. "The Progress of the Development of the New York Botanical Garden," by Dr. N. L. Britton.

November 16. "Edible Roots of the United States," by Dr. H. H. Rusby.

SCHOOL LECTURES

A series of lectures was given in the spring under the auspices of the Board of Education in connection with the nature study work of 4B and 5B grades of the City Schools. These lectures were at first confined to the pupils of the Bronx, but in the autumn of 1906 they were extended to those of Division III, Manhattan.

Grade 4B

Lecture I, "Cultivation of Plants," by Mr. George V. Nash, was given to groups of pupils on April 19, April 22, April 26, April 29, and May 3.

Lecture II, "Seedless Plants," by Dr. Marshall A. Howe, on May 6, May 10, May 13, May 17, and May 24.

Grade 5B

Lecture I, "Industries Depending on Forests. Plant Products," by Dr. H. H. Rusby, on April 16, April 18, April 23, April 25, and April 30.

Lecture II, "Woody Plants and Plants without Wood. Protection of Trees in Cities," by Dr. C. S. Gager, on May 2, May 7, May 9, May 14, and May 21.

Lecture III, "Classification of Plants," by Dr. N. L. Britton, on May 16, May 23, May 28, May 31, and June 4.

SCIENTIFIC MEETINGS

The botanical conventions, held bi-weekly in the library on Wednesday afternoons, have been interesting and well attended. A list of the principal topics discussed at these conventions during the past year is as follows:

January 23. "Nature Study as an Education," by Miss Mary P. Anderson.

February 6. "A Photomicrographic Apparatus," by Dr. C.

Stuart Gager; "The Marine Flora of Jamaica," by Dr. M. A. Howe.

February 20. "Some Plants from the far North," by Dr. P. A. Rydberg.

March 6. "Some Species of Hypocreales," by Mr. F. J. Seaver; "Review of some recent literature on plant poisons," by Dr. H. M. Richards.

March 20. "The Morphology of the Nymphaeaceae," by Dr. Melville T. Cook.

April 17. "Solution Tension and Toxicity in Lypolysis," by Dr. Raymond H. Pond.

November 6. Symposium of recent work upon Photosynthesis. Discussed by Professor H. M. Richards, Miss Winifred J. Robinson and Mr. Ralph C. Benedict.

These conventions were discontinued for a time on account of a course of lectures arranged for Wednesday afternoons at Columbia University.

The Torrey Botanical Club has held special regular meetings during the year in the Laboratory of the Garden.

A field meeting of the Bronx Society of Arts and Sciences was held at the Garden June 29 to discuss the care and protection of trees. This Society also held a field meeting on August 17 for the study of mosses and certain other plants.

The Horticultural Society of New York held its annual meeting and exhibition in the Museum on May 8 and 9; its summer exhibition on June 12 and 13; and its autumn meeting and exhibition on November 13 and 14.

Exercises commemorating the two hundredth anniversary of the birth of Linnaeus were held at the Garden on May 23. A full account of these exercises, in which several members of the staff took part, appeared in the Journal for June.

The international conference on plant hardiness and acclimatization, held in New York, October 1, 2 and 3, met at the Garden on October 3. The forenoon was devoted to the reading of papers and the afternoon to the inspection of the collections.

Respectfully submitted,
W. A. Murrill,
First Assistant.

REPORT OF THE HEAD GARDENER

To the Director-in-Chief:

Sir: I have the honor to submit the following report as Head Gardener for the year 1907.

Systematic Collections

Herbaceous Grounds. No alterations have been made in the arrangement of this plantation. There have been grown in the herbaceous collections during the year, including some still at the nurseries, 2,320 species. There have been added during the year 216 show labels.

Fruticetum. There are now in this collection 1,442 plants, representing, including some few still at the nurseries, 693 species and varieties. The completion of the grading in the area between the west lake and the driveway to the north permitted of the permanent planting of this tract, and plants representing the genera *Sambucus*, *Symphoricarpos* and *Diervilla* were transplanted in accordance with the plan employed in the remainder of the collection. The collection of specimens of *Weigela* and *Abelia*, temporarily located in the vicinity of the honeysuckles, were transplanted to this newly graded area, and form a permanent group along the driveway. The large triangle in the immediate vicinity was also planted with 29 specimens of the genus *Viburnum*, removed from the triangle south of the Museum. To the collections here have been added 198 show labels.

Salicetum. This collection of willows in the north meadows remains as it was, with 45 species and varieties and 125 specimens.

Deciduous Arboretum. There are in this collection, including those still at the nurseries and native to the tract, 255 species and varieties. The arboretum now contains in place 392 specimens.

Pinetum. Including those still at the nurseries, there are now represented 270 species and varieties. Of these 190 are in place in the pinetum itself, represented by 850 specimens. There have been added 44 show labels.

Conservatories. There are now in the conservatories 9,219 plants, an increase of about 600 over the number grown in 1906. This, together with the increase in the size of the plants, has emphasized the crowded condition of these buildings for some time past, and makes evident the immediate need for the completion of at least a part of the new range. This crowded condition is especially manifest in houses nos. 7 and 8, which are devoted to the smaller specimens of the tropical exogenous plants. House no. 4, which has hitherto served as an overflow house for plants which become too large for houses nos. 7 and 8, has itself become so crowded that there is not sufficient room for many additions there. There are many specimens at the propagating houses which might be placed on view in the public conservatories, were it not for this crowded condition. The following table gives the number of plants in each house:

House no.	1	394	House no.	9	92
"	2	446	"	10	460
"	3	312	"	11	261
"	4	440	"	12	748
"	5	1,519	"	13	515
"	6	808	"	14	641
"	7	749	"	15	1,099
"	8	735			

In the conservatory collections, including those at the propagating houses, there are now 204 families, 1,393 genera, and 7,881 species and varieties, represented by 18,364 specimens.

There have been 2,366 zinc and 102 lead show labels made for these collections, making a total of 2,468.

Propagating Houses and Nurseries. A great part of houses nos. 5 and 6 have been devoted to the study collection of cacti, and the larger part of house no. 4 has been given up to the experimental work in charge of the Director of the Laboratories. It has been necessary to make use of a portion of this house to accommodate the ordinary collections. A part of the nursery has also been reserved for the use of the Director of the Laboratories.

From various sources there have been received during the year 1,235 packets of seeds. In the various plantations 284 packets have been collected. There are now in the propagating houses, including the cold frames, 9,145 plants.

In the nurseries there are 2,627 specimens of woody plants, and 1,986 herbaceous plants.

Labeling, Recording and Herbarium. Up to the middle of May the work of this department was carried on under the direction of two garden aids, as described in my report of the previous year. At the above time, on the occasion of the resignation of Mr. Eggleston, the entire work of this department was assumed and has since been conducted in an efficient and satisfactory manner by Mr. Norman Taylor, garden aid. In carrying out this work, two men for the entire year and one for six months have been employed. The entire time of one of these employes has been used in the work of accessioning and making records, in making corrections on data labels, in the preparation of herbarium specimens, in the collecting of seeds, and other similar duties, the others have been employed in the manufacture of labels. In addition to the above the assistance of one garden aid has been available for a part of his time, mainly in work on the trees along the driveways and paths.

The following show labels have been made during the year :

Herbaceous Grounds	216
Morphological Garden	53
Economic Garden	294
Conservatories	2,468
Pinetum	44
Fruticetum	198
Trees along roads and paths	250
Conservatory pools	39
Conservatory decorative beds	296
	3,858

Accession numbers 26,035–29,089 have been recorded during the year, making a total of 3,055 accessions. The total number of plants derived from all sources has been 6,232, of which 3,416 were by gift, 342 from exchanges, 1,189 derived from seeds, 287 from our own collections, mainly from expeditions to the West Indies, and 998 by purchase; it will be seen that more than half of the plants secured during the year were obtained by gift.

There have been prepared 620 herbarium specimens of cultivated plants, 230 from the conservatory collections and 390 from those outside.

The following table gives the approximate number of species and varieties in the collections:

Conservatories	7,881
Herbaceous Grounds	2,320
Fruticetum	693
Deciduous Arboretum	255
Pinetum	270
Salicetum	45
Viticetum	34
	11,498

In addition to the above there are many species growing wild within the grounds which make the total number available for study considerably larger.

Miscellaneous Collections

Morphological Garden. The collections here have been considerably expanded during the year, 43 additional specimen plants having been added, making a total now of 161. The bed devoted to the ecology of stems and branches has been enlarged, and five new beds have been opened. The new beds are devoted to: ecology of roots; ecology of leaves; symbiosis; morphology of thorns; and modes of climbing. There have been added 53 show labels.

Economic Garden. This collection, the initial work on which was done in the fall of 1906, has been greatly increased during the year. A detailed account of this collection appeared in the Journal for August. There have been grown in this collection during the year, in 31 beds and along the brook, 230 plants, divided as follows: food plants, 141; medicinal, 65; condiments and relishes, 18; fibers, 6. For these plants 294 show labels have been supplied.

American Desert Plants. The large rectangular plot on the terrace in front of the south entrance to the conservatories, formerly in grass, was used for the purpose of displaying a collection of plants from the American deserts. An account of this in detail appeared in the Journal for August. It was one of the features of the conservatories, and attracted much attention. There were used in making this display 560 plants, representing 7 families and about 200 species.

Conservatory Lily Pools. The two pools in the court of the conservatories continue to be features of great interest. There were about 50 species and varieties of water lilies grown there, in addition to the two species of the royal waterlily, *Victoria.* The lead show label, which has proved so desirable for trees and shrubs and for the larger specimens in the conservatories, was used here during the summer in place of the zinc ones; 39 were placed in position.

Conservatory Flower Garden. The large rectangular plots, formerly covered with sod, at the foot of the terrace on the north side of the conservatories, were in part converted into flower gardens. A detailed account of this feature appeared in the Journal for May. The center of each plot was planted with a mixed collection of conifers, broad-leaved evergreens, and deciduous shrubs, the conifers largely predominating, so that a green effect might be secured during the winter months. Around this central planting a border 8 feet wide was given to herbaceous plants. It was thought desirable to have show labels for the herbaceous plants, and 296 such labels were placed there during the summer. A border of sod 2½ feet wide surrounds the herbaceous plants. There were used in the planting of these beds: 1,000 conifers and broad-leaved evergreens, the gift of Mr. Lowell M. Palmer; 500 deciduous shrubs; and 2,200 herbaceous plants;

making a total of 3,700 plants. These flower beds attracted much attention during the summer.

General Horticultural Operations

The force available consisted of the following: 3 foreman-gardeners, 14 gardeners, 4 apprentices, and 18 laborers. In addition to the above 1 driver for his entire time and 2 others during the mowing season were available for mowing and hauling.

This force was distributed as follows: 1 foreman-gardener, 9 gardeners, and 2 apprentices were detailed to the conservatories, including the care of the decorative planting in the immediate vicinity; 1 foreman-gardener, 1 gardener, and 2 apprentices to the propagating houses; 1 foreman-gardener, 4 gardeners, and the 18 laborers to the outdoor work.

The outdoor force was detailed as follows: museum tract, 2 laborers; conservatory tract, 1 gardener and 3 laborers; west border tract, 1 gardener and 2 laborers; fruticetum tract, 1 gardener and 3 laborers; herbaceous grounds tract, 1 gardener and 5 laborers; for miscellaneous operations, including the care of the arboretum and scythe work, 3 laborers. At the conclusion of outdoor work in the fall 2 of the gardeners were transferred to the conservatories. The 2 remaining gardeners were employed for the rest of the year in the usual gardening operations needing attention at that time.

In the matter of new park planting considerable was accomplished. During the spring the following work was performed. The west border to the north of the Mosholu bridge approach was rearranged, the planting being extended along the approach wall to the road, the additional shrubs necessary for this work being obtained elsewhere in the grounds. At the Woodland Avenue bridge the abutment was planted with a miscellaneous collection of conifers and poplars, and the space between the path and the road of the approach was partly planted with the Japanese barberry. The planting in the rear of the fountain near the Museum was considerably extended by the addition of a number of lower growing conifers in front of the taller ones already in position. The planting around the marble work at the foot of the approach to the Museum has been rearranged, the plants of *Ilex crenata* having been removed from their former position as a border to the conifers and used as a screen-planting on the sides of the enclosure, continuing that already there.

During the fall the following work was carried out: Near the entrance to the elevated approach, in the strip separating the path from the road, a row of Japanese barberries was planted to prevent encroachment upon this place by pedestrians and carriages. At the south gate a bed of Japanese barberries was planted around each pillar, extending considerably beyond the pillar in each direction, the barberries necessary for this work being secured from other plantations. The border in the corner near the elevated station was rearranged and thinned, the surplus being used in planting elsewhere. Portions of the south border, from which barberries had been removed for use elsewhere, were planted with other shrubs and rearranged. Eastward of the conservatories the ends of the grass strip separating the road from the path were planted with viburnums, taken from the triangle south of the Museum, thus necessitating a rearrangement there. The natural border of alders on the north shore of the middle lake was reinforced and carried around to the bridge by transplanting a number of wild plants from the immediate vicinity.

All herbaceous plantations, shrubs and young trees were carefully mulched with well-seasoned stable manure and leaf-mold at the beginning of winter. All manure needed has been obtained by supplying a dump for the use of the stables in the vicinity of the Garden, or by hauling from stables when our teams were not otherwise employed. These piles of manure have been turned twice, and form excellent fertilizer and material for mulching. Large piles of leaves raked from the lawns have yielded much leaf-mold of superior quality.

Investigations

Mr. Norman Taylor, garden aid, in addition to his work on the cultivated plants, has continued his studies on the *Potamogetons*.

I have continued my studies on the grasses of North America, in addition to work done by me in the cultivated collections, especially in the orchid and pineapple families; the increasing size of the Garden collections in these families, due largely to explorations carried on in the American tropics, makes this work of great interest.

Respectfully submitted,
George V. Nash,
Head Gardener.

REPORT OF THE HEAD CURATOR OF THE MUSEUMS AND HERBARIUM

To the Director-in-Chief.

Sir: I have the honor to submit my report as Head Curator of the Museums and Herbarium for the year 1907:

Accessions

Additions to the collections were obtained as follows:

(*a*) *Purchase.* Specimens mainly from the United States, Mexico, Central America, Asia and the Philippine Islands aggregate 5,690.

(*b*) *Gift.* A total of 6,931 specimens, representing a wide geographic area and a variety of objects, was added to the collections by donors.

(*c*) *Exchanges.* Specimens from Canada, the United States, Mexico, the West Indies, Colombia, Egypt and the Philippine Islands constitute a very large percentage of the total 7,763 secured by exchanges with other institutions and with individuals.

(*d*) *Exploration.* Exploration in the Bahamas, Jamaica, Montserrat and Antigua, and on the North American mainland, was the means of bringing together 10,718 specimens.

The collections were increased by 31,102 specimens.

Museums

The permanent museum equipment was increased by the addition of sixteen unit cases for the economic museum, and six table cases for the fossil plant museum; and by specimen jars as follows:

Glass jars. (Specimen jar no. 2605, Whitall Tatum Co.)

Diameter	Height	Number of jars
3 inches.	6 inches.	36
3 "	8 "	48
3¾ "	10 "	60
4½ "	12 "	72
	Total,	216

I. ECONOMIC MUSEUM. Specimens were added to all the exhibits of this museum, but the general plan of arrangement was unchanged except in the west wing, where the sixteen new exhibition cases were installed. The increase of the collections in the west wing necessitated their complete rearrangement.

II. SYSTEMATIC MUSEUM. The three elements comprising the systematic museum, namely, the Synoptic Collection, the Microscope Exhibit and the Local Flora, were increased by the addition of specimens or improved by the replacing of old specimens. No general rearrangement was necessary.

III. FOSSIL PLANT MUSEUM. About the end of the year six additional table cases for fossil plants were placed in the west hall of the basement. The whole exhibition space of the basement is now devoted to the fossil plant museum. The transfer of specimens, previously held in storage, to the new cases has been begun. The collections have been increased by a large number of specimens from the Cretaceous deposits at Kreischerville, Staten Island, New York, from the Grand Gulf formation of Alabama and from several of the South Atlantic states.

IV. LABELING. All new specimens added to the public exhibits of the several museums were furnished with printed labels. Several hundred labels printed during earlier years were rewritten and printed anew in order to have them conform to improved styles adopted later.

Herbarium

I. MOUNTING AND CONSERVING OF SPECIMENS. About 49,000 specimens, selected from those received during the year, and previous years, were incorporated in the permanent collections. The specimens fall into two groups:

(*a*) *Flat or pressed specimens.* About 47,000 specimens were poisoned and mounted on 36,184 sheets of herbarium paper, and distributed in the cases.

(*b*) *Bulky specimens.* About 2,000 specimens of fruits, seeds, stems and other parts of plants too thick to mount on sheets were placed in boxes and distributed in the cases.

The permanent equipment for conserving bulky specimens was increased by the following supply boxes:

Size of boxes		Number of boxes
4 × 2¾ × 1¼ inches		1,000
5½ × 5 × 1¼	"	500
5½ × 4 × 2½	"	500
8 × 5½ × 2½	"	250
8 × 5½ × 5	"	250
16 × 5½ × 5	"	75
Total		2,575

Fully 11,000 duplicate specimens were distributed, as exchanges, to several institutions and individuals in this country and abroad.

II. ARRANGEMENT OF THE HERBARIUM. The increase of the herbarium necessitated considerable rearrangement of several plant groups. Forty-one standard cases were added to the herbarium equipment; thirty-one of these were arranged in the large room at the extreme western end of the third floor, and the fungus collections have been placed in these cases. Ten cases were arranged in the main herbarium room to accommodate the additions made to the collection of flowering plants. Three special wall cases were built in the room formerly occupied by the collection of fungi to accommodate the rapidly increasing collections of mosses and ferns. Valuable sets of specimens from tropical America, both from the Antilles and from the mainland were added to the permanent collections.

Assistance and Investigations

Dr. W. A. Murrill, First Assistant of the Director-in-Chief, has had charge of the collection of fungi. Through his efforts considerable additions to the fungus collections were made, largely through the determination of specimens, and he has prepared twenty-five duplicate sets of the commoner polypores of the region about New York City. He published an article on Philippine polypores in the Bulletin of the Torrey Botanical Club. Two parts of the North American Flora, including the polypores, were completed and one has been published as number one of volume nine of that work.

Dr. Marshall A. Howe, Curator, continued the development of the collections of algae and hepatics. He collected marine algae during part of January in Jamaica and spent part of November and all of December exploring the more southern portions of the Bahamas, and throughout the year continued his studies on the North American marine algae. Some results of these studies were published in several papers. Dr. Howe continued to edit TORREYA with the coöperation of Dr. Philip Dowell.

Dr. Arthur Hollick, Curator, has had charge of the collection of fossil plants. He prosecuted field work at Kreischerville, Staten Island, N. Y., investigating the Cretaceous flora in coöperation with Professor Edward C. Jeffrey, of Harvard University. Dr. Hollick, with the voluntary assistance of Mr. Edwin W. Humphreys, a former student at the Garden, worked out the synonymy of the species to be represented in the new exhibition cases in order that the specimens may be rapidly and correctly labeled.

Dr. P. A. Rydberg, Curator, has taken care of the collection of flowering plants. He has also continued the preparation of the manuscripts both of the Rosaceae for a forthcoming part of the North American Flora and of his Flora of the Rocky Mountains. Dr. Rydberg published several papers on North American plants and two addresses which he delivered in connection with celebrations commemorative of the two hundredth anniversary of the birth of Linnaeus.

Mr. R. S. Williams, Assistant Curator, was occupied during the early part of the year in arranging and incorporating the Leighton and Hasse herbaria of lichens with the permanent collections of the Garden, and also in studying various West Indian collections of lichens. During the rest of the year Mr. Williams completed his studies on the second part of a large collection of Bolivian mosses, and also studied several smaller collections from various parts of tropical America. He studied the genera *Macromitrium*, *Campylopus* and various genera belonging to the family Neckeraceae for the preparation of manuscript for forthcoming parts of the North American Flora.

Mrs. Britton continued her voluntary oversight of the moss collection, directing the mounting of the Mitten herbarium, and naming the West Indian collections made by herself and others. She has also been giving critical study to several genera for the North American Flora.

Professor L. M. Underwood, chairman of the Scientific Directors, until his death on November 16, continued to devote the time he spent at the Garden to the study and development of the collection of ferns and fern-allies.

Dr. C. B. Robinson, Assistant Curator, was occupied mainly with work on the flowering plants of the Philippine Islands and with the compilation of a bibliography and the synonymy of the North American species and genera of Malpighiaceae. He spent five weeks exploring on the northern shore of the Gulf of St. Lawrence. Dr. Robinson continued as an associate editor of the Bulletin of the Torrey Botanical Club, compiling the "Index to Recent Literature," helped with the museum work and demonstrated at the nature-study work carried on by the Garden in cöoperation with the public schools of the city.

Dr. J. A. Shafer, Museum Custodian, had general care of the museum building and its contents. During parts of January and February he carried on exploration on the islands of Montserrat and Antigua, West Indies, while throughout the year he continued his studies on North American trees.

The writer, in addition to curatorial duties, revised and completed manuscripts of monographs of the families Geraniaceae, Oxalidaceae and Linaceae, all of which were published in part 1 of volume 25 of the North American Flora. Monographic studies on several other families are being carried to completion for publication in the same work. I have also continued my studies on the flora of the southeastern United States, more especially that of Florida.

Respectfully submitted,
J. K. Small,
Head Curator of the Museums and Herbarium.

REPORT OF THE DIRECTOR OF THE LABORATORIES

To the Director-in-Chief :

Sir: I have the honor to present herewith my report for the year ending December 31, 1907.

At the beginning of the year the exhibition of the New York Academy of Sciences, at the American Museum of Natural History, illustrating recent advancement in the various departments of science, begun on December 28, 1906, was still in progress, and remained open to the public until January 14, 1907. This exhibition included the section devoted to botany, of which I had the honor of being chairman, and some time was devoted to the supervision of the exhibits of the Garden and other exhibitors until the close of the exhibition and the return of the exhibits.

During the first part of the year there was no regular Laboratory Assistant, but the duties of that position were discharged by Miss Alice Adelaide Knox, in return for the privileges extended to her as assistant to Dr. D. T. MacDougal, of the Carnegie Institution. During the spring the experiments of Dr. MacDougal on the evening-primroses were terminated at the Garden, and the plants of his pedigreed cultures were shipped to him at the Desert Botanical Laboratory at Tucson, Ariz. The arrangement with Miss Knox terminated on May 1, and on July 1, Miss Winifred Josephine Robinson, who is on leave of absence from her position as instructor in botany, at Vassar College, was appointed Laboratory Assistant.

In October, Miss Anne M. Lutz, cytologist at the Station for Experimental Evolution, at Cold Spring Harbor, L. I., was appointed special assistant for three weeks. Her time was devoted to sectioning and staining material collected during 1905–06 from pedigreed cultures of the evening-primroses, for the purpose of studying their sporogeny and related problems. Among the immediate results of a study of these preparations may be mentioned the confirmation of the number of chromosomes in pure *Oenothera Lamarckiana* as 14. The agreement of this number with that obtained by Gates in this country and with Geert in Holland, removes all reasonable doubt on this important point.

The mechanical labor involved in the preparation of material (collecting, imbedding, sectioning, mounting, and staining) for such cytological studies as this, and for other histological researches is very considerable and often burdensome to the investigator, and the need of a permanent expert technician, or preparator, competent to do this work, is felt by several members of the staff. Such assistance would mean the saving of valuable time, and would thus make possible the undertaking and completing of more extended research than can now be accomplished.

A rearrangement of the herbaria at the Garden has necessitated the occupation of the room hitherto known as the Physiological Laboratory by the cases of the fungal herbarium. This deprives the laboratories of a room much used, and of special advantage in several ways on account of its skylight. This change also emphasizes the need of additional cases suitable for the storage of some of the larger pieces of glassware and apparatus. Physiological experiments would be greatly facilitated by the construction of a mezzanine floor under the skylight and above the herbarium-cases in the room above mentioned.

The investigations undertaken during the year have not necessitated the purchase of any large pieces of apparatus.

The equipment has been enlarged by the purchase of numerous smaller pieces to facilitate the researches in progress, and the appropriation not thus used has been expended for stains, reagents, and microscopical accessories.

Early in the spring the organization of the Morphological Garden was assigned to me. Several of the old beds have been enlarged, and five new beds started, in which are emphasized the ecological features, or the relation and adaptation of plants and plant organs to the various factors of environment. These five beds illustrate, respectively:

1. The morphology and ecology of roots.
2. The morphology and ecology of leaves.
3. The morphology and ecology of thorns.
4. Climbing organs, and modes of climbing.
5. Symbiosis, other than parasitism.

At your request, an outline has been prepared for a special section in the Museum to illustrate physiological, morphological, and ecological phases of plant life. Such an exhibit will possess an especial teaching value, and enhance the usefulness of the museum to teachers, and to classes in nature-study and elementary botany.

Meteorological observations have been continued throughout the year as usual. In addition to the records of precipitation and of soil- and air-temperatures, instruments for measuring the evaporating power of the air were installed on June 6, at three different stations. Station 1 was located on the dry, rocky, shaded knoll, just west of the propagating-houses; station 2 was in the low swampy region about 50 feet south of the stable; and station 3 was located in the experiment-garden, about six feet east of the instrument-shelter. These atmometers were installed and the records made in coöperation with Dr. Burton E. Livingston, of the Desert Botanical Laboratory of the Carnegie Institution, at Tucson, Ariz. Dr. Livingston has established in the United States a number of similar stations, throughout a wide range of latitude, longitude, altitude, and distance from large bodies of water, and the comparison of the observations from these various stations will doubtless yield valuable information in regard to a most important, though as yet inadequately understood ecological factor. The results of the observations at the Garden show that, for the period between June 10, 1907 and September 23, 1907, the amount of recorded precipitation was .85 inches in excess of the evaporating power of the air (loss from the evaporimeter) at the propagating-house, and 4.48 inches in excess near the stable, while in the experiment-garden the evaporating power of the air was 2.78 inches in excess of the precipitation recorded. A complete account of these observations and of their significance is published in the Journal of the Garden for December, 1907.

The minimum temperature recorded for the year was — 2°, on February 6, and the maximum temperature 93° on July 8, 18 and 25. The mean temperature for the year was, therefore, 45.50°. While the spring season, taken as a whole, was unusually cold and "late," the month of April was exceptionally warm, having a mean temperature of 48°, or 4.30 above the normal temperature for April for New York State. The total precipitation recorded was 47.01 + inches. The first fall frosts occurred during the first week in October.

On October 3 luncheon was served in the Morphological Laboratory to the members of the Horticultural Society of New York and their guests. Covers were laid for about fifty persons, and the room was decorated with potted plants and cut flowers from the Conservatories.

Early in December, circular letters were sent to all students who have been in residence at the Garden since its foundation, asking for information to be utilized in the compilation of complete academic records of such persons. This work cannot be completed until next year.

My own investigations during the year have been devoted mainly to a continuation of researches on the effects of radium-rays on plants. Guarded pedigreed cultures of the common evening primrose (*Oenothera biennis*) grown from seeds formed after an exposure of one or both germ-cells to radium-rays, have been carried through the first generation after exposure and interesting results recorded. The full significance and interpretation of these results can be ascertained only after the growth of the second generation during the coming year. The effects of these rays on indirect nuclear division, or mitosis, and on tropistic movements of plants have been studied, and reports of all three of the above lines of research were presented at the meetings of the American Association for the Advancement of Science, and affiliated societies, at Chicago, in December. Ten minor papers have been published during the year, in addition to several reviews. With your consent, I have acted as collaborator for plant physiology for the journal "Chemical Abstracts" since October.

With your permission, also, I have accepted an appointment on the staff of lecturers in the New York City Board of Education Course of Public Lectures. There are only one or two other lecturers in this course offering lectures on purely botanical subjects, with the exception of the subject of forestry. The popular presentation of botanical knowledge ought to increase public interest in that science and help toward a realization of its value, and thus further the rapidly growing appreciation of the Garden on the part of the public.

The buildings of the Tropical Laboratory of the Garden, at Cinchona, Jamaica, which were partially destroyed by the disastrous earthquake of the fourteenth of last January, have been repaired, but no investigators have been sent there since the earthquake.

A total of 31 persons have had the privileges of the laboratories, herbaria, and other collections during the year ending December 31, 1907, as follows:

Investigators registered before January 1, 1907.........	7
Registrations at the Garden since January 1, 1907	15
Total registrations..	22
Deduct for names counted twice...........................	7
Number of persons registered................................	15
Additional persons to whom the privileges of the laboratories and collections have been granted...........	16
Total number of investigators present during 1907......	31

I append a list of these persons, together with a portion of their academic record, and the problems upon which they were engaged.

*ANDERSON, MARY PERLE. Mt. Holyoke, B.S. 1890; Mass. Inst. Technology, 97–98. Univ. Chicago, 01–03; Supervisor Nat. Stud., Univ. School for Girls, Chicago, 01–03. Supervisor Nat. Study, Teach. Coll. Columbia Univ., 07–.
Geographical distribution of the ferns of Japan.

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*Registered also in Columbia University.

† ARTHUR, JOSEPH CHARLES. Iowa State Coll., B.S., 72; M.S., 77; J. H. U., 78–79; Harvard, 79; Cornell, D.Sc., 86; Bonn, 96. Prof. Veg. Physiol. and Pathol., Purdue, 87–. Botanist Indiana Exp. Sta., 88.
Investigation of Uredinales.

BENEDICT, RALPH CURTISS. Syracuse, A.B., 06; Aid, N. Y. Bot. Gard., 06–.
Taxonomy of ferns.

* BRANDENBURG, ELLEN CLAPP. George Washington Univ., B.S., 04; Teacher of botany, Washington, D. C., high schools.
Morphology of fungi.

* BURLINGHAM, GERTRUDE SIMMONS. Syracuse, A.B., 96; Woods Holl, 99; N. Y. Bot. Gard., 05–06; Preceptress, Ovid Union Sch., 96–98. Instr. in Biol., Binghamton high school, 98–05.
Taxonomy of Lactariae.
Physiological rôle of mineral nutrients.

* BUTLER, BERTRAM THEODORE. Hamline Univ., Ph.B., 01. Teacher in elementary and high schools, 90–98, and 03–07.
Flora of Montana.

COKER, WILLIAM CHAMBERS. Univ. So. Carolina, B.S., 94; J. H. U., Ph. D., 01; Bonn, 01–02. No. Carolina, Assoc. prof. bot., 02–. Asst. in bot., Cold Spring Harbor, 00. Chief bot. staff, Bahama Expedition of Baltimore Geog. Soc., 03.
Cytological investigations.

† COOK, MELVILLE THURSTON. Stanford, A.B., 94; DePauw, A.M., 01; Ohio State, Ph.D., 04. Instr. biol. DePauw, 95–97, Prof., 97–04. Chief, Dept. Plant Pathol., Estacion Central Agron. de Cuba, 04–06. Plant Pathologist, Delaware Agric., Exp., Station, Newark, Del., 07–.
Embryology.
Insect galls.

COWELL, JOHN FRANCIS.
Tropical and desert plants.

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† Research scholarship.

DARLING, CHESTER ARTHUR. Albion, A.B. 04; A.M., 06; Prof. biol., Defiance Coll., Ohio, 04–06. Asst. in bot., Columbia, 06–.

Morphology of spermatophytes.

Plant physiology.

† EARLE, FRANKLIN SUMNER.

Taxonomy of Agaricaceae.

EVANS, ALEXANDER WILLIAM. Yale, Ph.B., 90; M.D., 92; Ph.D., 99. Instr. bot., Yale, 95–01, Asst. Prof., 01–.

Taxonomy of mosses.

HAYNES, CAROLINE COVENTRY.

Taxonomy of Hepaticae.

HOYT, WILLIAM DANA. Georgia, A.B., 01; M.S., 04; J. H. U., 04. Tutor in biol., Univ. of Georgia, 01–04.

Taxonomy of marine algae.

HOUSE, HOMER DOLIVER. Syracuse, A.B., 02; Columbia, A.M., 04. Assoc. Prof. bot., Clemson Coll., 06–07. Aid, N. Y. Bot. Gard., 07–.

Revision of North American Convolvulaceae.

Comparative histology of Raimannia odorata and an experimentally produced derivative of the same.

HUMPHREYS, EDWIN WILLIAM. Coll. City of New York, A.B., 06.

Paleobotany.

JACKSON, HERBERT SPENCER. Cornell, A.B., 05. Assist. in bot., Cornell, 04–05. Asst. Plant Pathologist, Delaware Coll. Agr. Exp. Station, Newark, 05–. Instructor in bot., Delaware Coll., 05–.

Taxonomy of fungi.

† KERN, FRANK DUNN. Iowa State Univ., B.S., 04; Purdue, MS., 07. Lab. asst. in animal morphology and physiology, Univ. Iowa, 02–04. Special agt., Bureau Plant Industry, U. S. Dept. Agr., 04–05. Asst. botanist, Purdue Univ. Agr. Exp. Station, 05–.

Investigations of Uredinales.

* KIMURA, TOKUZO. Sapporo (Japan) Agr. Coll. Nogakushi (A.B.), 01; Stanford, A.B., 06; Instructor in nat. sciences, Tohoku Gaknim, Sendai, Japan, 01–03.

The control of sex in dioecious plants.

KNOX, ALICE ADELAIDE. Smith, A.B., 99; Columbia, A.M., 06. Assistant, Dept. bot. research, Carnegie Inst., 06–07.
Fasciation in the evening-primroses.

LIPSKI, WLADIMIR H.
Consulting library and collections.

MAXON, WILLIAM RALPH. Syracuse, Ph.B., 98. Aid, crypt. bot., Div. of Plants, U. S. Nat. Mus., 99–05; Asst. Curator, 05–.
Taxonomy of ferns.

MERRILL, ELMER DREW. Univ. Maine, B.S., 98; Med. Sch., Columbian, 00–01; Maine, M.S., 04. Asst. nat. sci., Maine, 98–99: Asst. agrostologist, U. S. Dept. Agr., 92–02; Botanist, Insular Bur. Agr. and Bur. Forestry, Manila, 02–03; Bur., Govt. labs., 03.
Examining Philippine collection.

MILLSPAUGH, CHARLES FREDERICK. Cornell, 72–75; N. Y. Homeop. Med. Coll., M.D., 81. West Virginia, Prof. bot., 91–92; Field Columbian Mus., Curator, dept. bot., 94–. Professorial lecturer, Chicago, 95; Chicago Homeop. Med. Coll., Prof. med. bot., 96–.
Taxonomy of cactaceae.

† POND, RAYMOND HAYNES. Kansas State Agr. Coll., B.S., 98; M.S., 99; Michigan, Ph.D., 02. Prof. bot. and pharm., Northwestern, 03–06. German Universities, 07–08.
Solution tension and toxicity in lipolysis.

* ROBINSON, WINIFRED JOSEPHINE. Michigan State Normal Coll., 92; Mich. Agr. Coll., 94; Univ. Mich., B.S., Pd.B., 99; Woods Holl, 99, 00; Columbia, M.A., 04. Instr. Training Dept., Mich. State Norm. Coll., 93–95. Instr. biol., Vassar, 00–. Lab. asst., N. Y. Bot. Gard., 07–08.
Taxonomy of the ferns of the Sandwich Islands.
Life-history of filmy ferns.
Nutrition of Sarracenia and Drosera.

SAGE, LILLIAN BELLE. Cornell, A.B., 01.
Morphology and taxonomy of mosses.

* SEAVER, FRED JAY. Morningside, B.S., 02; Iowa State, M.S., 04. Instr. biol., Iowa Wesleyan, 05–06. Fellow in bot.,

Columbia, 06–07. Asst. prof. bot., North Dakota Agr. Coll., and asst. in bot., Agr. Exp. Station, Fargo, N. D., 07–.
North American Hypocreales.

White, Edward Albert. Prof. floriculture, Massachusetts Agr. Coll.
Consulting the herbarium.

* Wilkins, Lewanna. Wellesley, A.B., 91.
Taxonomy of Solanaceae.

Wilson, Guy West. Depauw, B.S., 02; Ohio State, M.A., 05. Aid, N. Y. Bot. Gard., 06–07. Prof. biol., Upper Iowa Univ., Fayette, Ia., 07–.
Taxonomy of the Phycomycetes.

Respectfully submitted,
C. Stuart Gager,
Director of the Laboratories.

REPORT OF THE LIBRARIAN

To the Director-in-Chief:

Sir: I have the honor to submit the following report on the Library for the year 1907.

Upon my appointment as Librarian in October, I found the library in excellent condition in every respect; this reflected much credit not only upon my predecessor, but upon those who had the care of the Library during her absence in Europe for the five months immediately preceding my appointment.

According to a census of the Library, it contained at the end of the year 20,458 bound volumes, an apparent increase of only 96 volumes from the number stated in last year's report. This has necessitated a careful review of the statistics of the Library for the past few years, and a comparison of the recorded additions during 1906 with the figures shown by the census taken at the end of that year; the result has convinced me that last year's report contained a clerical error, by which the number of volumes was stated at 20,362 when it should have been 19,362. In this case, the actual increase shown by this year's census is 1096 volumes, and this probably approximates the actual number of additions. As in former years, no estimate has been made of the number of unbound pamphlets; nearly all of these, however, are in temporary covers, shelved, and catalogued, so that they may be consulted as conveniently as the bound volumes. The accessions during the year include 516 volumes purchased on the account of the special book fund, and 76 presented to the Garden.

During the year 704 volumes have been bound; of this number 52 were the property of Columbia University, on deposit at the Garden.

The additions to the catalogue have included about 3700 written cards. By this means the increase of the catalogue has kept pace with the growth of the Library; but although current additions during recent years have been catalogued both by author and by subject, the older portion of the Library is very inadequately catalogued, for the most part by author only. As long as there is no increase of the Library staff, this unfortunate condition must continue; but with additional assistance the catalogue might be made much more useful than it is at the present time.

Few alterations have been made in the exchange list during the year; these may be found by comparing the appended list of periodicals with the one printed last year.

The principal Library accessions have been published from time to time, as usual, in the Journal of the Garden.

Respectfully submitted,

JOHN HENDLEY BARNHART,

Librarian.

LIST OF PERIODICALS

* Periodicals subscribed for by the Garden.

† Periodicals subscribed for by Columbia University and deposited at the Garden.

‡ Periodicals received in exchange by the Torrey Botanical Club and deposited at the Garden.

All others are received in exchange by the Garden.

* Académie Internationale de Geographie Botanique, Le Mans, France. *Bulletin.*

Agricultural Experiment Station, Auburn, Ala.
" " " Tuskegee, Ala.
" " " Uniontown, Ala.
" " " Tucson, Ariz.
" " " Fayetteville, Ark.
" " " Berkeley, Calif.
" " " Fort Collins, Colo.
" " " New Haven, Conn.
" " " Storrs, Conn.
" " " Newark, Del.
" " " Gainesville, Fla.
" " " Experiment, Ga.
Agricultural Experiment Station, Honolulu, Hawaii.
" " " Moscow, Idaho.

Agriculturial Experiment Station, Urbana, Ill.
“ “ “ Lafayette, Ind.
“ “ “ Ames, Iowa.
“ “ “ Manhattan, Kan.
“ “ “ Lexington, Ky.
“ “ “ Baton Rouge, La.
“ “ “ Orono, Me.
“ “ “ College Park, Md.
“ “ “ Amherst, Mass.
“ “ “ Agricultural College, Mich.
“ “ “ St. Anthony Park, St. Paul, Minn.
“ “ “ Agricultural College, Miss.
“ “ “ Columbia, Mo.
“ “ “ Bozeman, Mont.
“ “ “ Lincoln, Neb.
“ “ “ Reno, Nev.
“ “ “ Durham, N. H.
“ “ “ New Brunswick, N. J.
“ “ “ Mesilla Park, N. Mex.
“ “ “ Geneva, N. Y.
“ “ “ Ithaca, N. Y.
“ “ “ Raleigh, N. C.
“ “ “ Fargo, N. D.
“ “ “ Wooster, Ohio.
“ “ “ Stillwater, Okla.
“ “ “ Corvallis, Oregon.
“ “ “ State College, Pa.
“ “ “ Mayaguez, Porto Rico, W. I.
“ “ “ Kingston, R. I.
“ “ “ Clemson College, S. C.
“ “ “ Brookings, S. Dak.
“ “ “ Knoxville, Tenn.
“ “ “ College Station, Texas.
“ “ “ Logan, Utah.
“ “ “ Burlington, Vt.
“ “ “ Blacksburg, Va.
“ “ “ Morgantown, W. Va.
Agricultural Experiment Station, Pullman, Wash.
“ “ “ Madison, Wis.
“ “ “ Laramie, Wyo.

Agricultural Gazette of New South Wales, Sydney, N. S. W.
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REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit the following report for the year 1907.

The collections under my charge have been increased by the addition of 200 specimens. This relatively small number of additions only partially represents the extension work of the year, since it so happens that much of our effort has been expended in arranging for additions which are expected to reach us during the year 1908. In two instances these arrangements are of such importance as to merit special mention at this time.

The installation of the Merck collection of proximate plant principles, announced in my last report, was but temporary, our plan for its permanent arrangement contemplating the addition of the crude materials from which the proximate principles are extracted. Much of this crude material is expensive and otherwise difficult to obtain. Its installation, moreover, would require a considerable expenditure for glassware, and some nine or ten additional cases, so that the execution of the plan was necessarily deferred. During the past year Messrs. Merck & Co. have very generously undertaken to complete their donation by contributing the entire collection of crude material desired, and together with it, the necessary bottles for its installation. Since sixteen new cases have been provided during the year, we are prepared to properly place this collection immediately upon its arrival, which is expected during January of 1908. A list of our desiderata was prepared and submitted to Messrs. Merck & Co., and from this list the label printing has already been begun.

During the past year, arrangements have been made with the leaders of a scientific expedition to the upper Rio Negro region, in Brazil, to make collections of economic materials for us. A list of our desiderata from that region was supplied to the collectors, together with careful instructions for the collection and preparation of the specimens.

Among the additions of the year, the following may be mentioned as of special importance.

Further additions to our collection of aboriginal foods of North America.

Accurately determined specimens of blackberries, contributed by Dr. Rydberg.

Twenty-three native drug plants, collected by Dr. J. A. Shafer.

A number of rare and new drugs representing importations of the year to this city.

Thirty specimens obtained by Dr. J. A. Shafer in Montserrat.

A very valuable and instructive set of fossil resins, contributed by Messrs. G. W. Patterson & Company, through Dr. Arthur Hollick.

Reference may also be made to the collection of seeds of a number of important drugs and other products, which have been planted in our propagating house.

For several years past it has been my wish to see introduced in some of our cases a new form of label, which should give a concise and simple descriptive account of the sets of material found therein, as for example, the India rubbers, the volatile oils, the resins, the sugars and starches, cork, chocolate, etc. The manuscript for a number of such descriptive labels was long ago prepared, but owing to the urgent requirements for printing in other departments, it has never been used. Recently, proofs of these labels have been received and approved by the Board of Scientific Directors, so that we may expect to see this interesting experiment put into operation during the coming year.

I have on previous occasions called attention to the necessity of making provision for the purchase of specimens for the Economic Museum. The bulk of easily obtainable material has now been secured, and it is necessary, in order to fill gaps which become more conspicuous as the collections become more complete, to arrange for the purchase of specimens which cannot readily be obtained in other ways.

I now offer the following suggestion for a plan, the execution of which would be of exceptional value to this department. By the coöperation of our Garden with a number of other similar institutions, it would be possible to place a collector in each of a number of districts into which the territory of the United States might be divided, and the greater portion of our native economic plant material could be collected in a single season. Each collector could procure a sufficient number of sets to supply one to each of the institutions thus coöperating, and a perfectly authentic representation of our economic flora could thus be placed on exhibition at a number of the more important centers of population throughout the country. The plan has been informally mentioned to the Director of the American Museum of Natural History and of the Field Museum, of Chicago, both of whom heartily approved of the suggestion. I believe that an appropriation of $1,000 from ten such institutions would be sufficient to accomplish this work.

Respectfully submitted,
H. H. RUSBY,
Honorary Curator of the Economic Collections.

REPORT OF THE SUPERINTENDENT OF GROUNDS

To the Director-in-Chief:

Sir: I have the honor to submit herewith my report for the year 1907.

Construction of Roads

The driveway bordering the river on the east, extending from the long bridge to the northern entrance of the grounds, was completed and thrown open to the public November 25. Stone for the completion of the foundation was hauled from the quarry back of the museum building during the previous winter and construction was resumed early in March.

A road extending northward from the plaza near the stable to the site of the new conservatories has been laid out, paved, and made ready for surfacing. Grading has also been commenced on the continuation of the driveway from this plaza southward.

The portion of unfinished road on the lake bridge and its approaches, about 500 feet in length and 40 feet in width, has also been completed during the year.

The new grades established for the Southern Boulevard made it necessary to raise the roadway and paths adjoining the southern entrance about a foot.

Building of Paths

Much progress has been made during the year in the completion of paths already begun and in the construction of new ones. 6,525 feet of paths measuring 11 feet in width, which were paved in 1906, as mentioned in a former report, were surfaced and opened to the public in 1907. 1,400 feet of pathway about the lakes and extending to the new boulder bridge were also surfaced and opened, after certain sections of unfinished paving were completed.

A woodland path 900 feet in length, extending from the herbaceous grounds to the southeastern boundary of the Garden, was completed in October; also two paths, together about 450 feet in length, on the ridge east of the museum building, connecting with the morphological garden, the economic garden, and the hemlock grove. The total length of the paths completed and opened to the public in 1907 is 9,275 feet; much of the work of construction, however, was done during the previous year.

New paths now under construction extend along both sides of the driveway in the north meadows from the Woodlawn Road approach to Newell Avenue bridge, and on the north side of the road between the Long Bridge and the plaza near the stable. This latter path, about 1,000 feet in length, has been graded, partly paved, and filled in for some distance with soft rock.

The sidewalks of the lake bridge have been concreted and surfaced with cement. The walks in front of the museum building have been repaired where necessary. The principal paths about the public conservatories have been resurfaced with screenings and rolled.

Regulating and Grading

Two areas adjoining the Mosholu bridge approach, one to the north measuring 250 by 400 feet and one to the east measuring 200 by 400 feet, were covered with top-soil to grade and sown as early in the spring as the weather permitted.

The shores of the middle lake and the banks bordering the road between the Long Bridge and the plaza to the east have been graded and sodded. Considerable filling was required near the bridges and along the line of the water-main, 700 cart loads of which was obtained from the road under construction leading to the new conservatories.

The grading at the economic garden was completed early in the spring, and in the autumn the banks of the brook flowing through the herbaceous grounds were built up with stone retaining walls and regraded, and the overflows reconstructed.

Water Supply

The one-inch water line in the herbaceous grounds and morphological garden has been extended to the northern end of the economic garden, a distance of 573 feet, with nine hose taps 40 feet apart, protected from frost by concrete boxes with cast-iron covers.

A six-inch main was connected 130 feet north of the lake bridge and carried between the road and path across the long bridge to the plaza near the stable, a distance of 1,536 feet. From this point northward a four-inch pipe was laid to the site of the new conservatories, a distance of 924 feet. The sections of pipe used on the Long Bridge, about 350 feet in total length, required a special covering to protect them from frost; the remainder were laid three or four feet below the surface of the ground. A fire hydrant was attached to the four-inch pipe.

The one-inch pipe near the railway station was extended temporarily to the Mosholu Parkway approach. The two-inch water pipe laid under the river three years ago having been exposed by the construction of the Boulder Bridge, it was lowered three feet below the water line to protect it from frost.

Drainage

As early in the season as the weather permitted the drainage to the Fordham University grounds at the low point about 200 feet west of the south gate was connected by 45 feet of pipe to a main sewer constructed previously by the city up to the boundary line of the Garden. A catch basin was built and connected, and the grade raised along the border fence sufficiently to protect the university grounds against surface drainage from the Garden.

The overflow of the large fountain in front of the museum building was connected in April with the drainage into the upper lake, 396 feet of eight-inch pipe being laid for this connection.

The cellar under the lecture hall of the museum building was drained by laying 20 feet of six-inch pipe connecting with the eight-inch drain.

Three catch basins were constructed, one west of the Long Bridge and two at the northern end of the economic garden.

About 90 feet of six-inch pipe were laid at low points under roads where catch basins are yet to be constructed. It was found necessary also to use 380 feet of porous tile at various low points in the herbaceous and morphological gardens and on the east side of the river.

In order to improve the surface drainage, about 3,000 feet of grass gutters along the old driveways had to be lowered and resodded. All the catch basins were examined regularly and cleaned when necessary.

Buildings

The public conservatories have been given a general overhauling for the first time since their construction. Ventilators, fanlights, doors, sash, glass, and other parts or fixtures needing repair have received attention; and the exterior has been painted and the cellar kalsomined. Two additional airshafts and two manholes have been constructed to improve the circulation of air in the steam trenches. The drainage of the houses has also been cleaned and repaired where necessary.

The propagating houses were given a coat of paint on the outside and the cellar was kalsomined. One of the heaters was replaced by a new one. Minor repairs were made as found necessary.

The stable has needed very few repairs. The drainage beneath the stall-floor has been much improved and the space filled with ashes. An inventory of machinery and tools shows a good stock on hand and all in good repair except a number of hand mowers that have been in use for five or six years, which can hardly be repaired to advantage. About 20 tons of hay were harvested, sufficient to last all the year. Expenditures for oats, straw, bran and salt amounted to $880.23.

Miscellaneous

A new line of telephone cable with eight conductors has been laid from the museum building to the plaza near the stable, a distance of 2,765 feet, and a branch line with four conductors extended from this point to the site of the new conservatories, a distance of 1,130 feet. The old cable has been taken from the bed of the river at the crossing and laid over the new boulder bridge.

The use of the local telephone system for hourly reports from the night-watchman has proven very satisfactory. This method is not only a safeguard against injury to Garden property, but is also a protection to the watchmen themselves.

The number of visitors at the Garden during 1907 was about 25 per cent. greater than in previous years. Seventeen persons were arrested, as against thirty-five in 1906. Fifteen of these were fined, one reprimanded, and one discharged by the police court magistrate.

The hackmen have observed the conditions of their permits much more satisfactorily during the past year, and all these permits have been renewed.

Twenty additional rustic benches were built for the grounds by the carpenters during the winter, but the great increase of the path system makes it necessary to build as many more when opportunity offers.

Respectfully submitted,
F. A. SCHILLING,
Superintendent of Grounds.

REPORT OF THE CHAIRMAN OF THE BOARD OF SCIENTIFIC DIRECTORS FOR 1907

TO THE BOARD OF MANAGERS, NEW YORK BOTANICAL GARDEN:

Gentlemen: I have the honor to submit the following report for the year 1907.

Meetings have been held according to schedule, on April 13, June 8, October 11 and December 14.

The various reports submitted by the heads of departments to the Director-in-Chief exhibit commendable activity in all lines of the Garden's work, notwithstanding some curtailment, an inevitable result of the shortage of funds, to be hereinafter discussed.

The explorations of the year have been of unusual interest, because several of them have been specially arranged to continue the surveys of regions in which much work has previously been done. Of this nature were the explorations of the Director-in-Chief in Jamaica, of Dr. Howe in the same region, resulting in a highly important collection of marine algae, and of Dr. Howe and Mr. Wilson in a hitherto unvisited portion of the Bahamas. Much important work of the same character still remains to be done in the West Indies, and in Central America, and plans for its performance have been carefully considered by this Board. The exploration of Montserrat by Dr. Shafer resulted in procuring some important material for the economic, as well as for the general collections.

The additions to the collections during 1907 were very large. Special reference should be made to the purchase of the herbarium of the late Dr. Otto Kuntze, which is, for several reasons, of a somewhat unique character; also to a valuable collection of varnish resins placed in the Economic Museum, and a large collection of diatoms presented by Mrs. Adelaide S. Van Brunt. It has been resolved by this board that steps should be taken to secure the collection of fungi and mosses left by the late Dr. Underwood, all his other collections having already come into possession of the Garden.

Several of the year's publications should be here mentioned. These include three parts of the "North American Flora," aggregating 236 pages. It is an interesting matter of record that this important publication is already on a self-supporting basis. Bulletin No. 14 is a contribution of 161 pages to the flora of Bolivia. Other equally important publications are nearly ready for issuance.

In the line of general education, some of the work of the year is very noteworthy. The official guide book has been largely distributed and has already demonstrated its great value in making the Garden more generally recognized by the public as an important educational institution. The experiment of providing visitors with guides to the grounds and buildings has been found successful and should unquestionably be continued. The Economic Garden has been completed and is a valuable addition to the plantations; it has proved very attractive to large numbers of visitors, and is certain to become more so, as its trees, shrubs and other perennials are perfected by growth. The planting of the spaces in front of the conservatory has also been greatly appreciated by visitors. Perhaps the most important single element in our educational progress consists in the practical completion of the labeling of specimens, and the inauguration of some improved methods of labeling, as set forth in the special reports of several of the departments. Of the same nature are the provisions for guide and descriptive leaflets, elsewhere reported. Educational work for the protection of native plants, under the provisions for the administration of the Stokes Fund, has been successfully pursued. An important public Saturday afternoon lecture course was provided, as usual, in spring and autumn, and the largely increased attendance was most encouraging. In this connection it is interesting to report that Assistant Director Dr. Murrill has been granted leave of absence to accept an invitation to deliver a course of lectures in July, 1908, on wood-destroying fungi, at the Biltmore School of Forestry.

In discussing the changes of personnel in the Garden, it becomes my sad duty to report one of the most severe losses that we could be called upon to suffer, in the death of Professor Underwood, for some years past the chairman of this board. This sad event occurred on November 16 at his home in Redding, Connecticut, Professor Underwood having continued his valuable services to the Garden almost to the day of his death. Our Board, at its meeting of December 14, adopted a preamble and resolutions commemorative of Professor Underwood's services to the Garden and to botanical science.

After very careful consideration, we decided at our October meeting to reëstablish the office of Assistant Director, and appointed Dr. Murrill to that position, in reporting which it is our pleasure to speak in the highest terms of the ability and efficiency which have characterized Dr. Murrill's discharge of the duties of First Assistant, which position he has filled since December, 1905.

At our April meeting, leave of absence without pay for the summer, was granted to our Librarian, Miss Vail, and arrangements were made to fill the position by the temporary appointment of Professor F. S. Earle. At our October meeting, Miss Vail informed us that other duties would prevent her from continuing in the position of Librarian, and her resignation was regretfully accepted. We were fortunately successful in securing the services of Dr. John Hendley Barnhart to succeed Miss Vail.

It has been proposed by the trustees of Columbia University, that the relations between the Garden and the University, which have always been most helpful to us, be strengthened by the acceptance by our Director-in-chief, Dr. Britton, of the following appointment:

PRESIDENT'S ROOM, January 6, 1908.

PROF. N. L. BRITTON,
New York Botanical Garden,
Bronx Park, New York.

My dear Dr. Britton:

It gives me great pleasure to advise you that the Trustees, at their meeting to-day passed a resolution making the Director of the New York Botanical Garden ex-officio a member of the Faculty of Pure Science, with the rank of professor.

Hoping that this action will be agreeable to you,

I am
Sincerely yours,
(signed) NICHOLAS MURRAY BUTLER,
President.

At our meeting of December 14, Dr. Britton was authorized to accept this appointment, and we recommend that this action be confirmed by the Board of Managers.

The curtailment of the Garden's income available for scientific and educational purposes, resulting from the decreased appropriation for maintenance made by the city, has been a source of serious concern to us, and demands the most earnest attention of the Board of Managers.

Owing to the necessity for using a large portion of the Garden's income from membership dues and invested funds for purposes of ordinary maintenance, as has been made evident to the Scientific Directors by the reports of the Director-in-Chief, we have recommended very small allowances from Garden income for the educational and scientific work of the Institution. The cost of maintaining collections of living plants is cumulative, and it is a self-evident proposition that such cost must increase with the extent of the collections. The Scientific Directors realize, however, that it would be most unfortunate to stop the growth of the collections, which have now become of international importance, or to decrease in any way the educational power of the Garden. The initial stage of such an institution as this, represents the inauguration of a definite plan of development, the execution of which necessarily involves certain lines of extension. At our meeting on December 14, 1907, we therefore adopted the following resolution:

Resolved, That the Scientific Directors request the Board of Managers for authority to solicit contributions to a fund of not less than $10,000 for the purposes of increasing the collections of living plants, of museum and herbarium specimens, and of the library, during the year 1908.

The new public conservatories now under construction require that further collecting be done during the year in tropical America, and portions of this desired fund would be used for that purpose. The grounds have been improved and developed so that much additional planting can be done to great advantage, and for this purpose additional funds are needed; the effort to secure for the library the older botanical literature, fast becoming rare and increasingly difficult to obtain, a policy already approved by the Board of Managers, should be continued, and the development of the museums also demands additional funds.

In conclusion, we commend to your attention the several administrative and departmental reports which will shortly be placed before you in printed form.

H. H. Rusby,
Chairman.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS, AND MEMBERS

To the Board of Managers of the New York Botanical Garden.

Gentlemen: The number of new members who have qualified during the past year is 63. The number of annual members is now 927; life members 167; sustaining members 29; fellowship members 6.

Of these 24 are now in arrears for dues for 1907, 9 are in arrears for 1906 and 1907, 7 are in arrears for 1905, 1906 and 1907, and 6 are in arrears for 1904, 1905, 1906 and 1907.

Annual dues have been collected to the amount of $8,750, which has been transmitted to the Treasurer as received.

Three persons have qualified as life members by the payment of $250 each. These sums have been transmitted to the Treasurer for credit to the Endowment Fund.

One person has qualified as a sustaining member by the payment of $25. This sum has been transmitted to the Treasurer.

A complete list of all classes of members to date is herewith submitted.

Benefactors

Hon. Addison Brown,
Andrew Carnegie,
Columbia University,
* Hon. Charles P. Daly,
D. O. Mills,
J. Pierpont Morgan,
John D. Rockefeller,
* Cornelius Vanderbilt.

Patrons

Oakes Ames,
* Mrs. Geo. Whitfield Collord,
* James M. Constable,
* Wm. E. Dodge,
Geo. J. Gould,
Miss Helen M. Gould,
Mrs. Esther Herrman,
John S. Kennedy,
* Oswald Ottendorfer,
William Rockefeller,
* Wm. C. Schermerhorn,
Jas. A. Scrymser,
* Samuel Sloan,
Mrs. Antoinette Eno Wood.

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* Deceased.

Fellows for Life

James B. Ford,
Morris K. Jesup,
John Innes Kane,
Hon. Seth Low,
M. F. Plant,
Miss Caroline Phelps Stokes,
Miss Olivia E. Phelps Stokes,
Samuel Thorne,
Tiffany & Co.,
H. C. von Post.
Francis Lynde Stetson,

Life Members

Edward D. Adams,
Dr. Felix Adler,
A. G. Agnew,
Mrs. James Herrman Aldrich,
Richard H. Allen,
Bernard G. Amend,
Constant A. Andrews,
J. Sherlock Andrews,
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John Sinclair,
Francis Louis Slade,
Albert K. Smiley,
Daniel Smiley,
Chas. F. Smillie,
Dr. A. Alexander Smith,
Mrs. Annie Morrill Smith,
Arthur Smith,
F. M. Smith,
Mrs. George W. Smith,
H. Sanborn Smith,
James R. Smith,
Sydney A. Smith,
Wm. Alex. Smith,
Samuel B. Snook,
E. G. Snow,
Isaac N. Solis,
Leopold Solomon,
E. G. Stoltman,
Chas. Sooysmith,
Mrs. Charlotte Sorchan,
Frederick Southack,
W. M. Sperry,
I. M. Spiegelberg,
Paul N. Spofford,
Miss Anna Riker Spring,
J. R. Stanton,
James H. Stebbins,
Henry Steeger,
James R. Steers,
Chas. H. Steinway,
Wm. R. Steinway,
Olin J. Stephens,
Benjamin Stern,
Isaac Stern,
Louis Stern,
Alexander H. Stevens,
Frederic W. Stevens,
Dr. Geo. T. Stevens,
Lispenard Stewart,
Wm. R. Stewart,
Miss Clara F. Stillman,
Dr. D. M. Stimson,
James Stokes,
Mason A. Stone,
Sumner R. Stone,
Miss Marie H. Story,
William Stratford,
Chas. Strauss,
Frederick Strauss,
F. K. Sturgis,
Mrs. F. K. Sturgis,
Edmund Sturzenegger,
Rutherford Stuyvesant,
Mrs. Geo. Such,
Mrs. James Sullivan,
Lionel Sutro,

Miss P. C. Swords,
Miss Mary Taber,
Edward N. Tailer,
James Talcott,
C. A. Tatum,
Miss Alexandrina Taylor,
George Taylor,
Henry R. Taylor,
Stevenson Taylor,
C. H. Tenney,
H. L. Terrell,
Jno. T. Terry,
Nikola Tesla,
Thomas Thacher,
Ernst Thalmann,
Benjamin Thaw,
Geo. C. Thomas,
Seth E. Thomas,
David W. Thompson,
John C. Thompson,
L. S. Thompson,
Mrs. Samuel C. Thompson,
Dr. W. Gilman Thompson,
Jonathan Thorne,
Samuel Thorne, Jr.
W. V. S. Thorne,
C. C. Tiffany,
Louis C. Tiffany,
Frank Tilford,
James Timpson,
J. Kennedy Tod,
William Tousey,
Miss Amy Townsend,
Mrs. Jane A. Townsend,
C. D. Tows,
J. Evarts Tracy,
Mrs. Mary S. Trimble,
Wm. Trotter,
Frederick K. Trowbridge,
Dr. Alfred Tuckerman,
Paul Tuckerman,
Geo. E. Turnure,
Benjamin Tuska,
Mrs. Eliza L. D. Tysen,
E. S. Ullman,
Mrs. Lawsen Valentine,
Augustus Van Cortlandt,
Alfred G. Vanderbilt,
D. B. Van Emburgh,
E. H. Van Ingen,
W. Van Norden,
Edgar B. Van Winkle,
Robert A. Van Wyck,
Richard C. Veit,
Herman Vogel,
John Wagner,
Richard T. Wainwright,
Leopold Wallach,
Wm. I. Walter,
Artemus Ward,
Wm. T. Wardwell,
John Hobart Warren,
Allan C. Washington,
E. H. Weatherbee,
Mrs. John A. Weekes,
Chas. Wehrhane,
Camille Weidenfeld,
Charles W. Wells,
Mrs. John Wells,
Mrs. Ada L. Westcott,
Geo. Westinghouse,
Dr. John McE. Whetmore,
Dr. Geo. G. Wheelock,
Dr. Wm. E. Wheelock,
Miss Caroline White,
Horace White,
John J. White, Jr.,
James Whiteley,
Miss Gertrude Whiting,
Giles Whiting,

Clarence Whitman,
Miss Margaret S. Whitney,
Wm. Wicke,
Edward A. Wickes,
D. O. Wickham,
M. T. Wilbur,
Mrs. I. T. Williams,
Mrs. Percy H. Williams,
Richard H. Williams,
W. P. Willis,
Charles T. Wills,
George T. Wilson,
Henry R. Wilson,
Miss Margaret B. Wilson,
R. T. Wilson,
Egerton Winthrop,
Grenville L. Winthrop,
Mrs. Frank S. Witherbee,
Ernst G. W. Woerz,
Emil Wolff,
Lewis S. Wolff,
Mrs. Cynthia A. Wood,
Henry R. Wood,
James Wood,
Jas. T. Woodward,
Prof. R. S. Woodward,
W. H. Woolverton,
Isidor Wormser,
P. B. Worrall,
Miss Julia Wray,
Mrs. J. Hood Wright,
A. Wurzburger,
Jno. J. Wysong,
Arthur G. Yates,
Edw. L. Young,
Andrew C. Zabriskie,
August Zinsser,
Charles Zoller,
O. F. Zollikoffer.

SCHEDULE OF EXPENDITURES DURING 1907, UNDER APPROPRIATIONS MADE BY THE BOARD OF MANAGERS

1. CITY MAINTENANCE ACCOUNT			$75,000.00
Salaries			
Appropriated		62,399.67	
Expended		62,399.67	
Supplies and Repairs			
Appropriated		12,600.33	
Expended by N. Y. Botanical Garden	9,192.33		
Expended through Park Dept., contract for coal	3,408.00	12,600.33	
Total expended			75,000.00
2. CONSTRUCTION AND EQUIPMENT			23,792.83
Expended — Salaries and Labor		16,921.46	
Expended — Sundry Expenses		6,871.37	
Total Expended			23,792.83

3. GARDEN ACCOUNTS

Assistance for Treasurer		
Appropriated		180.00
Expended		180.00
Circulars for Membership		
Appropriated	200.00	
Transferred from Contribution to Maintenance	500.00	700.00
Expended		690.86
Balance		9.14
Contingent Fund		
Appropriated	1,500.00	
Transferred from Contribution to Maintenance	910.00	2,410.00
Expended		2,405.64
Balance		4.36

Editorial Assistance

Appropriated		720.00
Expended	660.00	
Transferred to Museums and Herbarium	60.00	720.00

Expenses of Consulting Chemist

Appropriated		300.00
Expended		300.00

Exploration and Collecting

Appropriated	600.00	
Transferred from Lectures and Lantern Slides	125.00	
Transferred from Contribution to Maintenance	830.00	1,555.00
Expended		1,551.60
Balance		3.40

Contribution to Maintenance

Appropriated		13,000.00
Expended — Labor	5,425.62	
Expended — Supplies	2,184.18	
Transferred to Contingent Fund	910.00	
Transferred to Horticultural Prizes	25.00	
Transferred to Insurance	20.00	
Transferred to Library	710.00	
Transferred to Museums and Herbarium	750.00	
Transferred to Purchase of Plants	200.00	
Transferred to Special Assistance	75.00	
Transferred to Stable Equipment	250.00	
Transferred to Exploration and Collecting	830.00	
Transferred to Lectures	410.00	
Transferred to Photography	210.00	
Transferred to Circulars for Membership	500.00	
Transferred to Resident Research Scholarships	500.00	12,999.80
Balance		.20

Horticultural Prizes

Appropriated	200.00	
Refund on freight overpaid	6.09	
Transferred from Contribution to Maintenance	25.00	231.09
Expended		224.00
Balance		7.09

Income of Lydig Fund (Publications)

Appropriated	2,300.00	
Subscriptions to North American Flora	684.75	2,984.75
Expended		2,893.81
Balance		90.94

Income of Stokes Fund (Preservation of Native Plants)

Appropriated	200.00
Expended	200.00

Income of Students' Research Fund

Appropriated	200.00
Expended	50.00
Balance	150.00

Insurance

Appropriated	400.00	
Transferred from Contribution to Maintenance	20.00	420.00
Expended		418.26
Balance		1.74

Investigations at Other Institutions

Appropriated		150.00
Expended	110.85	
Transferred to Purchase of Plants	35.00	145.85
Balance		4.15

Laboratories

Appropriated		800.00
Expended	642.80	
Transferred to Photography	100.00	
Transferred to Purchase of Plants	55.00	797.80
Balance		2.20

Lectures and Lantern Slides

Appropriated	500.00	
Transferred from Contribution to Maintenance	410.00	910.00
Expended	781.11	
Transferred to Exploration and Collecting	125.00	906.11
Balance		3.89

Library

Appropriated	1,000.00	
Sale of duplicate books	5.00	
Transferred from Contribution to Maintenance	710.00	
Refunds — overcharges on expressage	1.56	1,716.56
Expended		1,716.33
Balance		.23

Museum and Herbarium

Appropriated	2,000.00	
Transferred from Contribution to Maintenance	750.00	
Transferred from Editorial Assistance	60.00	
Refund — overcharge on expressage	.38	2,810.38
Expended		2,809.16
Balance		1.22

Photography

Appropriated	200.00	
Transferred from Contribution to Maintenance	210.00	
Transferred from Laboratories	100.00	510.00
Expended		509.24
Balance		.76

Publications. (*General Fund*)

Appropriated	500.00	
Refunded on freight overpaid	2.76	502.76
Expended		502.71
Balance		.05

Purchase of Plants.

Appropriated	200.00	
Transferred from Contribution to Maintenance	200.00	
Transferred from visits to other Institutions	35.00	
Transferred from Laboratories	55.00	

Transferred from Resident Research Scholarships	50.00	
Transferred from Stable Equipment	37.50	577.50
Expended		569.14
Balance		8.36

Resident Research Scholarships

Appropriated	500.00	
Transferred from Contribution to Maintenance	500.00	1,000.00
Expended	950.00	
Transferred to Purchase of Plants	50.00	1,000.00

Secretary

Appropriated		1,500.00
Expended		1,500.00

Special Assistance

Appropriated	400.00	
Transferred from Contribution to Maintenance	75.00	475.00
Expended		465.00
Balance		10.00

Stable Equipment

Transferred from Contribution to Maintenance		250.00
Expended	212.50	
Transferred to Purchase of Plants	37.50	250.00
Total Appropriated for Garden Accounts	27,550.00	
Subscriptions (Income of Lydig Fund)	684.75	
Sales	5.00	
Refunds	10.79	28,250.54
Total Expended for Garden Accounts		27,952.81
Balance		297.73

4. SPECIAL GARDEN ACCOUNTS

Conservatory Fund

Subscribed 1900	2,110.00	
Subscribed 1901	25.00	

Refund — Balance on draft	15.27	
Subscribed 1902	486.55	
Refund — Unexpended Balance	9.70	
Subscribed 1903	200.00	
Sale of duplicate palms	100.00	
Sale of plants	78.00	
Sale of Palms 1904	125.00	3,149.52
Expended 1900	710.44	
Expended 1901	1,437.42	
Expended 1902	404.41	
Expended 1903	447.66	
Expended 1904	121.21	3,121.14
Balance		28.38

Exploration Fund

Subscribed 1901	2,050.00	
Refund — Balance on drafts	87.59	
Subscribed 1902	2,130.00	
Refund — Unexpended Balance	180.56	
Subscribed 1903	1,565.00	
Refunds — Unexpended Balances	275.11	
Subscribed 1904	3,183.45	
Refunds — Unexpended Balances	110.50	
Subscribed 1905	2,575.00	
Sale of duplicate palms	100.00	
Refunds — Part of Expenses — Exploration to the Bahamas	125.00	
Subscribed 1906	1,050.00	
Subscribed 1907	2,510.00	
Refunds	529.84	16,472.05
Expended 1901	2,130.95	
Expended 1902	1,258.32	
Expended 1903	2,880.72	
Expended 1904	2,878.28	
Expended 1905	3,003.37	
Expended 1906	1,027.25	
Expended 1907	2,274.84	15,453.73
Balance		1,018.32

Museum and Herbarium Fund

Subscribed 1901	1,800.00	
Subscribed 1902	655.00	
Refund (advance charges on specimens account of R. S. Williams)	131.09	
Subscribed 1903	1,405.00	
Sale of specimens	29.50	
Subscribed 1904	100.00	
Subscribed 1906	2,550.00	6,670.59
Expended 1901	1,546.19	
Expended 1902	1,024.96	
Expended 1903	1,437.63	
Expended 1904	100.00	
Expended 1906	2,224.57	
Expended 1907	250.00	6,583.35
Balance		87.24

Special Book Fund

Subscribed 1899	4,950.00	
Subscribed 1901	1,825.00	
Subscribed 1902	2,265.00	
Subscribed 1903	1,315.00	
Special Contribution from Mr. Andrew Carnegie	1,997.88	
Sale of Books	59.60	
Refunded — Balance on drafts	20.93	
Subscribed 1904	1,540.00	
Sale of Duplicate Books	15.15	
Subscribed 1905	2,175.00	
Sale of Duplicate Books	25.50	
Subscribed 1906	310.00	
Subscribed 1907	100.00	16,599.06
Expended 1899	1,916.65	
Expended 1900	2,395.28	
Expended 1901	2,463.02	
Expended 1902	2,256.25	
Expended 1903	3,397.75	
Expended 1904	1,031.92	
Expended 1905	2,178.99	

Expended 1906	748.29	
Expended 1907	195.28	16,583.43
Balance		15.63
Total expended from Funds of the Garden		30,672.93

WALTER S. GROESBECK,
Accountant.

E. & O. E.

NEW YORK, January 13, 1908.

REPORT OF THE TREASURER

New York, January 13, 1908.

To the Board of Managers of the New York Botanical Garden:

Gentlemen: Herewith I submit a statement of my receipts and disbursements during the year 1907, and a balance sheet from my ledger as of December 31, 1907.

Respectfully yours,
C. F. Cox,
Treasurer.

Receipts

Balance as per last Annual Report......		$ 14,536.10
Contributions of the City towards Development and Maintenance		92,720.87
Income from Investments:		
5 per cent. on $50,000 Southern Railway Co. First Consolidated Mtge. Bonds	$ 2,500.00	
4½ per cent. on $50,000 Ches. & Ohio R. R. Co. Genl. Mtge. Bonds	2,250.00	
4 per cent. on $50,000 Erie R. R. Co. Prior Lien Bonds.............	2,000.00	
4 per cent. on $59,000 Erie R. R. Co. Penn. Collat. Trust Bonds...	2,360.00	
4 per cent. on $50,000 Reading R. R. Co., Jersey Central Collat. Trust Bonds	2,000.00	
4 per cent. on $24,000 Northern Pacific R. R. Co. St. Paul & Duluth Division Bonds.................	960.00	
4 per cent. on $30,000 Northern Pacific-Gt. Northern, C. B. & Q. Collat. Trust Bonds................	1,200.00	13,270.00
Annual Dues.................................		8,830.00
Interest at 3 per cent. on balances on deposit with J. P. Morgan & Company		368.07

Proceeds sales of Merchandise		78.55
Proceeds sales of Publications		167.48
Life Membership Fees		750.00
Fellowship Members Fees		600.00
Sustaining Members Fees		725.00
Tuition Fees credited to Students' Research Fund		15.00
Subscriptions to "North American Flora" credited to Income of David Lydig Fund		634.25
Contributions to Special Book Fund		210.00
Contributions to Exploration Fund		2,469.05
Contributions to Endowment Fund		250.00
		$135,624.37

Disbursements

Expenses paid through Director-in-Chief account City Appropriations	92,720.87	
On General account for vouchers paid	22,645.68	
	$115,366.55	
Purchase of Collection of Lichens, account Museum and Herbarium Fund	250.00	
Expenses Lectures on Preservation of Native Flora, account income of Stokes Fund	200.00	
Books, account Special Book Fund	327.81	
Specimens, etc., account Exploration Fund	2,948.00	
Publications, account income of David Lydig Fund	3,700.76	
Income of Students' Research Fund — Grants	100.00	122,893.12
Balance, Cash in hands of Treasurer		$ 12,731.25

Ledger Balances, December 31, 1907

Credit

Permanent Funds:

Endowment Fund	$271,160.00
Fellowship Fees	11,000.00

Life Membership Fees	19,000.00	
Students' Research Fund	2,679.50	
David Lydig Fund — Bequest of Chas. P. Daly	34,149.86	
Stokes Fund	3,000.00	
Temporary Funds:		
Special Book Fund, for Library	15.63	
Conservatory Fund, for Plants	28.38	
Exploration Fund	124.37	
Museum and Herbarium Fund, for Specimens	87.24	
Income Students' Research Fund	234.83	
" Stokes Fund	159.13	$341,638.94

Debit

Investments:		
Net Cost of $30,000 Ches. & Ohio Ry. Co. Genl. Mtge. Bonds	$302.611.68	
$50,000 Southern Ry. Co. 1st Consol. Mtge. Bonds		
$50,000 Erie R. K. Co. Prior Lien Bonds		
$59,000 Erie R. R. Penn. Coll. Trust Bonds		
$50,000 Reading R. R. Co. Jersey Cent. Coll. Trust Bonds		
$24,000 N. Pacific R. R. Co. St. Paul & Duluth Div. Bonds		
$30,000 N. Pacific-Gt. Northern C. B. & Q. Coll. Tr. Bonds		
Director-in-Chief, Working Fund	25,000.00	
General Income Account, Balance borrowed from Permanent Funds.	371.57	
Income David Lydig Fund, Balance borrowed from Permanent Funds.	924.44	
Cash in hands of Treasurer	12,731.25	
	$341,638.94	$341,638.94

No. 66 Broadway,
New York, January 30th, 1908.

James A. Scrymser, Esquire,
Chairman of the Finance Committee,
New York Botanical Garden,
New York City.

Director-in-Chief's Account for 1907.

Sir: This is to certify that I have by your direction examined and audited the financial books and accounts of the Director-in-Chief of the New York Botanical Garden for the year nineteen hundred and seven (1907) and that I find the same to be correct and the Cash Balance to be as stated in the Current Cash Book.

This auditing does not include the examination of the vouchers for either City Maintenance or Construction Work, paid for by the city, such vouchers having been found proper and in order by the city authorities and you having decided in 1904 that a further examination of them by me was unnecessary.

I have omitted, also, a detailed examination of the Annual Membership Dues Account, as per like instructions in 1904. These dues are received by the Director-in-Chief and forwarded by him to the Treasurer, the former keeping a detailed record of the same.

Respectfully submitted,
(signed) J. L. Merrill,
Special Auditor.

No. 66 Broadway,
New York, January 30th, 1908.

James A. Scrymser, Esquire,
Chairman of the Finance Committee,
New York Botanical Garden,
New York City.

Treasurer's Account for 1907.

Sir: This is to certify that I have, by your direction, examined the books and accounts of the Treasurer of the New York Botanical Garden for the year nineteen hundred and seven (1907) together with their proper vouchers and that I find the Balance Sheet and the Treasurer's Statement of Receipts and Disbursements, attached hereto, to be correct.

I have, also, examined the various Investment Securities and find the same to be as reported in the said Balance Sheet.

Respectfully submitted,
(signed) J. L. Merrill,
Special Auditor.

VOL. 6 NO. 20

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED MARCH 23, 1909]

CONTENTS:

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1908, ... 115
Report of the Assistant Director, ... 137
Report of the Head Curator of the Museums and Herbarium 148
Report of the Honorary Curator of the Economic Collection, ... 153
Report of the Director of the Laboratories, . . . 157
Report of the Librarian, ... 164
Report of the Head Gardener, ... 187
Report of the Superintendent of Grounds, . . . 195
SCHEDULE OF EXPENDITURES DURING 1908, . . . 201
REPORT OF THE COMMITTEE ON PATRONS, FELLOWS, AND MEMBERS, ... 208
REPORT OF THE TREASURER, ... 223

BULLETIN

OF

The New York Botanical Garden

Vol. 6. No. 20.

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1908

(*Presented and accepted January 11, 1909*)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: I have the honor to submit herewith my report as Secretary and Director-in-Chief for the year ending January 11, 1909:

The development of all departments of the Garden has made noteworthy progress during the past year. Much additional land has been improved by grading, by the construction of additional roads and paths, and by sowing and planting, by means of a city appropriation of $25,000, partly expended. A portion of the second range of public conservatories and the boiler house necessary for them have been completed, by means of a former city appropriation. A commencement in fencing the Garden has been made by the construction of a stone and iron fence along the southwestern boundary. The collections of living plants, of museum and herbarium specimens, and of books, have been much increased, mainly by gifts and by the work of expeditions sent into tropical America. The collections of living plants, both in the grounds and greenhouses, have been more completely labeled, and much additional labeling has been accomplished on the museum collections. The educational work of the institution, as respects the visiting public, pupils from the public schools, and special students, has been continued. The number of visitors has been greater than during any previous year. The permanent funds of the Garden have received only slight additions, but a legacy from the estate of the late William R. Sands, payable during the present year, will add $10,000. Pursuant to authority given the Scientific Directors at the last annual meeting, a sum of $10,000 has been raised by subscription and applied to the increase of the collections, through purchases and exploration and collecting. The total value of gifts of living plants, specimens and books aggregates about $1,286; these gifts have been recorded in the monthly JOURNAL. The maintenance of the Garden has been accomplished by the expenditure of the city appropriation of $75,000, supplemented by a special appropriation of $15,000 made by the Board of Managers for this purpose at the last annual meeting. The necessity for making this appropriation seriously curtailed the development of educational work and limited the increase of the collections.

The total membership of the Garden is now 1,116, a decrease of about 46 from 1907.

Grading and Drainage

Excavation of earth and rock at the rear of the museum building, in order to bring the surface at that point to the contours contemplated by the general plan of development, has been continued at intervals, and several thousand cubic yards of material have been removed, and all utilized in filling swampy ground and in the foundations of roads and paths in the northern and eastern parts of the Garden. In the spring somewhat more than half an acre of land at the rear of this building was covered with topsoil brought from the lines of new roads and paths on the eastern side of the grounds and the area was sown with grass seed, after growing a crop of crimson clover on it during the season. An equal or greater area here may be brought into lawn during the next year, inasmuch as the excavation of rock is going forward during the winter.

The surroundings of the new boiler house and greenhouses on the eastern side of the Garden have been partially graded and work is still in progress at that point, and much grading was done along the road and path approaches to these buildings. Owing to the necessity of providing a drain running under the floor of the cellar at the new greenhouses a very deep excavation had to be made for about 500 feet; inasmuch as this drain had to underlie not alone the cellar of the greenhouses constructed during the year, but also under the extension of these houses planned for future construction, the cellar for the greenhouses still to be constructed was partially excavated, in order to save moving the same earth twice, and this surplus earth was used in grading along the river road where it was needed to complete the banks.

A strip of land about 2,000 feet long and averaging 10 feet wide along the new fence at the southern boundary, was graded and prepared for planting after the fence was constructed.

Much grading has also been done along the driveway at present under construction, leading from the plaza near the stable to the southeastern corner of the Garden. Minor grading operations have included the surfacing of banks and other small areas in various parts of the grounds uncompleted during previous years.

During the grading operations on the eastern side of the grounds a large amount of drain pipe has been laid and many additional catch basins built. The construction of the new fence on the southwestern boundary made it necessary to build a new drainage connection with a comfort station near the end of the elevated railroad approach, for a distance of about 200 feet, and also to make a new steam connection for this building with power house no. 1. The same trench was used for both the new drain pipe and the new steam pipe conduit.

A long stretch of marshy ground at the foot of the bank at the eastern side of the fruticetum plain and west of the Bronx River, has been filled by cinders from the power house, and thus prepared for the building of a path, and cinders have also been used for filling in swampy grounds where paths are to be built at the northern end of the Garden. Cinders were also used for the foundations of the sidewalks on the Long Bridge over the Bronx River. No material for filling has been brought from without the Garden during the year, and it now appears that the intent of the original plan of development that the material to be excavated would about equal the necessary filling, would be quite accurately carried out. This adjustment of material has doubtless saved the expenditure of many thousands of dollars. Some outside material was obtained in the early years of development, free of charge.

Construction of Roads and Paths

Proceeding parallel with the grading work, great progress has been made in the construction of additional driveways and walks on the eastern side of the grounds, the surplus rock being used for foundations, and the trap rock needed for surfacing being supplied through contracts awarded by the Department of Parks, a steam roller of the Department being used to finish the road surfaces. The approach to conservatory range no. 2, about 900 feet long and 30 feet wide, has been essentially completed, requiring only a little rolling in the spring. The remaining portion of the main driveway, extending from the plaza near the stable to the southeastern corner of the grounds, has been partially constructed, the necessary grading having been nearly all done and about 400 feet prepared for final rolling; rock for the Telford foundation of the remainder is being carted there from behind the museum building during the winter. The completion of this stretch of about 1,600 feet will finish all driveways planned for the Garden, and if work progresses favorably, it should be ready for use by midsummer.

Paths connecting the eastern ends of the Boulder Bridge and of the Long Bridge across the Bronx River, with public conservatory range no. 2, have been completed in a manner similar to the development of the driveways. A path near the north side of the upper lake, unfinished last year, was also completed. In the north meadows the foundations for paths approaching the Upper Bridge were made with surplus rock, and minor portions of paths to connect work previously accomplished were built at several points. The total length of paths completed during the year is about 2,200 feet.

Bridges

The three driveway bridges and the Boulder Bridge for pedestrians, built in previous years, have required no repairs, and are in good order.

The bridge planned by the Park Department to replace the present wooden foot bridge south of the waterfall near the Lorillard Mansion, referred to in my last annual report, has not yet been built, although plans for it have been approved by the Department, by the Board of Managers of the Garden, and by the Municipal Art Commission, and an appropriation voted by the Board of Estimate and Apportionment two years ago is available for its construction, which will probably be accomplished during the present year. It is necessary that this work should be done, owing to the present wooden bridge being altogether too small for the visiting crowds in summer and suspicions of its safety have been entertained. As planned, the new bridge will enable visitors to cross the gorge of the Bronx at a much higher level than the present bridge occupies and thus avoid descending a somewhat dangerous slope.

Water Supply

No extension of the water supply was made during the year, but by means of a city appropriation for construction a contract for 2,000 feet of six-inch water main was awarded by the Department of Parks in the autumn, and it is expected that this order will be filled within a short time, thus enabling us to nearly complete the six-inch water main system as planned through the western part of the Garden, and it is hoped that an additional amount may be obtained during the year so as to complete the system east of the Bronx River. This six-inch water main, as laid and planned, will ultimately supply water immediately alongside nearly the entire driveway system of the Garden, and will be provided with hosetaps at intervals of about 150 feet, thus enabling the watering of the driveways by hoses instead of by watering carts, as referred to in my last annual report.

Buildings

The contracts for the construction of part of public conservatory range no. 2 and for its boiler house referred to in my last annual report were completed late in the season, except for certain minor defects which are being corrected by Kelly & Kelley, the contractors. The completion of these buildings was so long delayed that it will not be practicable to use them until spring. The contractors met with unforeseen difficulty from ground water, and were otherwise embarrassed. It is now intended to move collections of plants from conservatory range no. 1 and from the propagating houses into the new greenhouses in April and May. These new buildings have been well constructed and will doubtless be satisfactory. The completion of this conservatory range no. 2 may go forward when funds are available; sufficient additional greenhouse space is now provided to relieve the crowded condition of conservatory range no. 1.

The older buildings have been kept in repair, somewhat increased expenditure of money having been necessary for such work than during previous years. The roof of the museum building developed a number of leaks and it was found necessary to relay large areas of the roof tiles, and a similar defect was thus corrected on the roof of power house no. 1. The exterior of conservatory range no. 1 was painted throughout during the year and repairs to the glazing were accomplished at the same time. This great area of glass is standing the weather very well; it will be necessary to paint the entire interior of this structure during the coming year.

Detailed accounts of the maintenance and repairs of buildings will be found in the reports of the Assistant Director and of the Superintendent of Grounds, hereto appended.

Boundary Fences

A contract of the Department of Parks with Guidone & Gallardi for the construction of a boundary wall and fence along the property line of Fordham University, referred to in my last annual report, was satisfactorily completed in the summer. After consultation with officials of the New York Central and Hudson River Railroad Company relative to the western boundary of the Garden, adjoining the right-of-way of that corporation, plans were approved by them, by the Board of Managers of the Garden, and by the Commissioner of Parks for the Borough of the Bronx, contemplating the construction of an iron and concrete fence along this entire boundary, except where it is broken by driveway entrances, and by the railroad station; the plans also include provision for the construction of an underground conduit, partly on Garden land and partly on land of the railroad company, to contain all telegraph and telephone wires now strung on poles along this line, the entire expense to be borne by the railroad company on condition that it be granted the use of a strip of land two feet wide extending from the Bedford Park Boulevard bridge about 600 feet south to the elevated railway station. The officials of the railroad company are now seeking to obtain the necessary authority from the city for such use of this two-foot strip of land.

A rustic fence of red cedar was constructed during the summer along the southern boundary of the Garden from the herbaceous grounds eastward to the Bronx Park entrance.

Telephone Service

All the buildings of the Garden are now connected by underground telephone cables, and in accordance with the recommendation in my last annual report, steps have been taken to establish a central booth in the museum building for both this Garden service and for the local and long distance telephone. Two extension stations were established in the museum building late in the year, one on the upper floor and one in the administration office.

Plants and Planting

Planting, in accordance with the general plan of development, has been continued as rapidly as the grading operations have been finished in various parts of the grounds, much having been accomplished during the past autumn. This has included additions to the herbaceous garden, the economic garden, the ornamental flower gardens, the fruticetum, the arboretum and the pinetum, and also the planting of many trees and shrubs along the driveways and paths and in the boundary borders. A new boundary border was formed along the new fence from the elevated railway approach eastward to the Southern Boulevard, and preparation was made for planting an additional herbaceous border at the elevated railway station.

The labeling of the plants, both in the out-door collections and in the public conservatories, has made very satisfactory progress, about 4,700 new labels having been prepared, as appears from the report of the Head Gardener, herewith submitted, and to which reference is made for further details of the work of his department.

Contributions of money for the purchase of plants, credited to the "Conservatory Fund," have been received during the year as follows:

John D. Archbold	$100
H. C. Fahnestock	100
C. N. Bliss	50
Mrs. Birdseye Blakeman	10

Hemlock Grove

I have not carried out the recommendation made in my last annual report that the trails and paths in the hemlock grove be fenced, in order to restrict visitors to well defined lines of travel, owing to the objection which properly exists to any construction which might detract from the natural beauty of this woodland. Large printed notices were placed at the entrances to the grove requesting visitors to keep to the paths and trails and not to injure the trees in any way, and these have doubtless had some effect in preventing indiscriminate tramping through the woods, and, as far as our available force of guards has permitted, visitors have been instructed to keep on the paths. The difficulty of the situation lies in the fact that altogether too many trails have been worn in various parts of the woodland, and in the fact that no reasonable number of guards can possibly control forty or fifty acres of woodland when crowded with people on a Sunday in summer. It is now proposed, as an experiment, to fence off the ends of many of these unnecessary trails. After such trails have grown up again the fencing may be removed. Practically all the chestnut trees within the hemlock grove have been kiled by the chestnut fungus and many of these trees were cut out during the late winter of last year, but some still remain, and it is proposed to take these down this winter, in accordance with the agreement between the Garden and the Park Department, which requires that the cutting out of any trees within the grove shall be under the observation of a Park Department official detailed for this duty.

Museums

A great many specimens have been added to the public museums during the year, principally by interpolation, in order to more completely illustrate the families of plants and the groups of plant products. This has necessitated the rearrangement of several cases in the economic museum. All specimens have been carefully examined from time to time in order to detect any deterioration from insect depredations, but no serious difficulty has been encountered, as all specimens have been thoroughly poisoned before being put in place. The museum of fossil plants, on the basement floor, was greatly enlarged by the filling of six new floor cases, and the illustration of plant remains thus expanded is now one of the most complete in existence.

The Scientific Directors have approved the construction of certain models of flowers and fruits for use to further illustrate the features of families of plants in the systematic museum.

These models, prepared by Miss Katherine E. French, are very accurate and very beautiful; a series of them would be of high educational value, and it is hoped that funds may be secured which will enable the Scientific Directors to obtain a large number.

The labeling of the specimens in the museum has proceeded with their installation and, with the exception of some portions of the fossil plant collections, nearly all specimens are now provided with printed labels.

For detailed accounts of work in this department, reference is made to the report of the Head Curator of the Museums and Herbarium and to that of the Honorary Curator of the Economic Collections, hereto appended.

Herbarium

This important scientific collection of dried specimens has been increased during the year by about 56,000 specimens, the largest single accession being the herbarium formed by the late Dr. Otto Kuntze, which was purchased for the Garden by means of money contributed by Mr. Andrew Carnegie. The curators continuously studied this collection and others, and much progress has been made in the determination of specimens hitherto unnamed: they have also done a great deal of work in rearranging the herbarium and making it more readily available for reference. Addtional data concerning the herbarium will be found in the report of the Head Curator.

Contributions of money to the special fund for scientific and educational work have been received as follows, and expended for the purchase of specimens:

Contributions of money to the Special Fund for scientific and educational work have been received as follows, and expended for the purchase of specimens.

Andrew Carnegie..	$1,000
James A. Scrymser	100
Edward V. Z. Lane	100
Mrs. Henry C. Potter	100

S. S. Palmer	50
Cleveland H. Dodge	50
Mrs. David Dows	50
Samuel R. Betts	50
Samuel P. Avery	25
Benj. F. Deklyn	25
Mrs. Henry Draper	25

Library

During the year 490 volumes and 572 pamphlets were added by purchase and received by gift, together with a large number of volumes and parts received in exchange for our publications from other institutions. A complete list of the institutions with which the Garden is in exchange for publications will be found in the report of the Librarian, hereto appended. A count of the books on the shelves made January 9, 1909, shows that this collection now consists of 21,230 volumes. The purchase of the older literature of botany, systematically begun three years ago, has been continued, and many gaps have been filled. In order to secure additional works which are continually becoming rarer, I propose to send our Librarian, Dr. John H. Barnhart, to Europe during the summer, for the purpose of visiting a considerable number of bookdealers and selecting from their stock such works as we most need, instead of selecting from the catalogues submitted by bookdealers as we have hitherto done in building up this collection. The books purchased during the year were nearly all obtained by the expenditure of sums contributed by friends of the Garden to the special fund for the increase of the collections, a total of $3,130 having been credited to the purchase of books, but not completely expended. I submit herewith a list of contributors and the amounts given by them.

John Innes Kane	$500
James B. Ford	250
Geo. S. Bowdoin	200
Francis Lynde Stetson	100
Edward S. Harkness	100

Miss Elizabeth Billings	100
Chas. G. Thompson	100
John E. Parsons	50
H. L. Terrell	50
Mrs. Richard M. Hoe	50
James Douglas	50
Mrs. Auguste Richard	50
Walter Jennings	50
C. W. Burroughs	50
Addison Brown	50
C. F. Cox	50
E. Thalman	50
August Belmont	50
Anonymous	50
Mrs. Morris K. Jesup	50
Mrs. William H. Bliss	50
Mrs. I. T. Williams	25
Anthony Dey	25
Adrian H. Joline	25
L. A. Heinsheimer	25
James J. Higginson	25
Geo. D. Barron	25
Woodbury G. Langdon	25
Edmund Coffin	25
Wm. A. DuBois	25
Miss Elizabeth S. Hamilton	25
Mrs. John Campbell	25
Louis C. Tiffany	25
R. P. Lounsberry	25
Miss Julia Wray	25
Wm. Shillaber	15
Mrs. Harriet Lord Britton	10
Miss Caroline C. Haynes	10
E. J. de Coppet	10
Alfred Tuckerman	10
Wm. Alex. Smith	10
James R. Steers	10
C. Temple Emmet	10
D. W. Thompson	10
Wm. H. Fischer	10

H. de Coppet	10
A. W. Evarts	10
Mrs. Miles B. Carpenter	10
Frederick Strauss	10
Wm. A. Read	10
Chas. Curie	10
E. P. Bicknell	10
Theo. F. Jackson	10
L. F. Dommerick	10
Mrs. Samuel A. Blatchford	10
M. D. Howell	10
David Lydig	10
Wm. Nilsson	10
August Eimer	10
Louis Haupt	10
Edward Russ	10
Mrs. Geo. W. Smith	10
John H. Bloodgood	10
Miss Caroline Harriot	10
Robt. S. Woodward	10
E. S. Ullman	10
C. R. Corning	10
Chas. Zoller	10
Jonathan Thome	10
C. Zeitz	10
Mrs. M. Story	10
Henry J. Robinson	10
Mrs. C. H. Coster	10
Mrs. James H. Aldrich	10
Ludwig Rothschild	10
Jno. I. D. Bristol	10
Anonymous	10
Roland T. Knoedler	10
J. Clarence Davies	10
Mrs. Wm. M. Kingsland	10
L. H. Biglow	10
Geo. R. Fallon	10
Guy R. McLane	10
B. F. Drakenfeld	10
Mrs. Samuel Lawrence	10

Robert C. Ogden	10
Wm. D. Ellis	10
F. Ambrose Clark	10
Mrs. Robert E. Westcott	10
K. K. Mackenzie	10
Miss Emily Redmond	10
J. C. Havemeyer	10
J. Sherlock Andrews	10
E. A. S. Clarke	10
R. R. Govin	10
Mrs. Wm. Combe	10
G. W. Curtis	10
Henry Iden	10
C. W. McAlpin	10
Mrs. R. B. Dula	10
Frederic W. Stevens	10
Olin J. Stephens	5
H. C. Bumpus	5
Mrs. Chas. A. Macy, Jr.	5
Julius Heiman	5
C. T. Church	5
C. D. Blauvelt	5
Wm. R. Steinway	5
Benj. Thaw	5
I. Adler	5
H. Fernstrom	5
Mrs. James Sullivan	5
John B. Lawrence	5
Edward N. Tailer	5

The cases already constructed in the library room have provided enough space for shelving the accessions of the year, but additional provision needs now to be made for the growth of the library, and the room west of the library reading room, formerly used as a laboratory, has been emptied and prepared for additional steel bookcases; one bookcase has been ordered and is expected to be constructed during January.

Dr. John H. Barnhart, Librarian, was ill with typhoid fever during the latter part of the year and has been obliged to be away on leave of absence for several months. It is with great pleasure that I report that his complete recovery now seems to be assured, and we expect him to return to his duties early in the spring.

Laboratories

The work carried on in the laboratory room just west of the library, now devoted to library extension, has been transferred to other rooms in the laboratory system. Special investigations by many students have been carried on in this department during the season, as outlined in the report of the Director of the Laboratories, hereto appended. No noteworthy modifications in the equipment have been found necessary.

Dr. C. S. Gager, Director of the Laboratories during the earlier part of the year, resigned in August to accept the position of Professor of Botany in the State University of Missouri, and Mr. Fred. J. Seaver, a former student at the Garden, was called from the Agricultural College of North Dakota to fill this position; his specialty is vegetable pathology, especially as regards fungus parasites, and this knowledge will be of great advantage to the Garden in its relation to the collections of living plants.

The tropical laboratory of the Garden at Cinchona, Jamaica, maintained in coöperation with the Department of Agriculture of that island, has been occupied during the autumn by Miss Alexandrina Taylor, who proposes to remain there for about a year. Miss Taylor is engaged in a study of the life history of certain tropical ferns, which can only be satisfactorily carried out under such conditions as Cinchona affords. Several other students have made application for the privilege of working at Cinchona during 1909. The buildings are in capital condition, and a residence there in the salubrious climate of West Indian mountains at an altitude of 5,000 feet, is a most delightful experience, it being practically in a subtemperate climate with a tropical flora of great variety.

Lectures and Demonstrations

Public lectures have been delivered in the lecture hall of the museum building, as in previous years, on Saturday afternoons during the spring and autumn; the audiences have been appreciative and somewhat larger than ever before. The number of lectures has not been increased, although, as suggested in my last annual report, an experiment of delivering them on Saturday afternoons throughout the summer might be worth making.

Lectures and demonstrations to children and teachers of public schools of the Borough of the Bronx were given, both in the spring and in the autumn, the total attendance having been over 20,000.

A detailed report on lectures and demonstrations and an account of meetings held at the Garden during the year will be found in the report of the Assistant Director hereto appended.

Guides and Guide-Books

The system of detailing aids and assistants for the personal guidance of visitors applying for such assistance has been continued, and this arrangement of personally conducting visitors through the grounds and buildings has been highly appreciated by those who have taken advantage of it. No change has been made in the plan of visits, a different part of the Garden being selected for each afternoon in the week, except Sundays, leaving the front door of the museum building at three o'clock.

The edition of the guide-book issued late in 1907 has sufficed, but a new edition will evidently be needed during the year, and as many changes have been made, and all departments of the Garden considerably developed since that time, a second edition becomes desirable. This guide-book, together with unmounted photographs of special features of the Garden, its publications and picture postal cards, have been kept on sale at the approach to the elevated railway station and in the museum building.

Exploration

Contributions to the special fund raised by the Scientific Directors, amounting to $3,930 have been credited to exploration and a small sum in addition has been available from ordinary income. A balance of the special fund, amounting to about $1,000 remains unexpended. A list of the contributors to the Exploration Fund with amounts given is herewith submitted.

J. Pierpont Morgan	$1,000
D. O. Mills	500
N. L. Britton	250
Wm. K. Vanderbilt	250
Mortimer L. Schiff	250
H. C. Von Post	100
Samuel Thorne	100
Miss Catherine A. Bliss	100
Thos. H. Hubbard	100
Geo. W. Perkins	100
A. F. Esterbrook	100
Wm. D. Sloane	100
W. Bayard Cutting	100
Geo. F. Baker	100
M. F. Plant	100
Robert W. de Forest	50
Bradley Martin	50
A. G. Agnew	50
Bernard G. Amend	50
Louis Marshall	50
Wm. Church Osborn	50
Mrs. Wm. R. Barr	50
Bernard G. Gunther	50
Emerson McMillin	50
A. J. C. Anderson	25
Jas. W. Cromwell	25
Ralph Wurts-Dundas	25
Henry Holt	25
John S. Huyler	25
Henry F. Osborn	25
T. A. Havemeyer	25

Anonymous	25
B. F. Deklyn	25
G. E. Dimock	5
	$3,930

The work of continuing collecting plants in Tropical America was continued by several expeditions. Accompanied by Dr. Arthur Hollick, a Museum Curator, and by Mrs. Britton, I was absent from the Garden from February 22 to April 16, engaged in continuing the botanical survey of the island of Jamaica.* Mr. R. S. Williams, an Assistant Curator, was in Panama, absent from January 25 until midsummer. † I made another trip to Jamaica in August and September, accompanied by Mrs. Britton. These three expeditions have added greatly to our collections and have resulted in the discovery of many species new to science and of much increased knowledge of the tropical American flora. Dr. John K. Small, Head Curator of the Museums and Herbarium, left the Garden on January 3, 1909, for the purpose of continuing his exploration work in the everglade region of southern Florida.

Dr. William A. Murrill, Assistant Director, spent two weeks in July at Biltmore, North Carolina, collecting fungi, and coöperating with the Biltmore Forest School.‡ Dr. P. A. Rydberg, a Museum Curator, was in the field from New York to Virginia, during the late summer, especially engaged in studying the wild blackberries. Considerable local collecting in the immediate vicinity of New York City has been done by other members of the staff.

It is desirable that the exploration of the West Indies and Central America be continued during 1909, and some money in the Exploration Fund is available for expenditure, though more than now seems available could be spent to great advantage. Portions of Cuba and of Santo Domingo are little known botanically and I recommend that our next exploration work be carried on in those islands. Looking forward to this I have detailed Mr. J. A. Shafer, Museum Custodian, for a visit to northeastern Cuba, and he will leave the Garden for that work on January 13. This exploration work, as has been previously pointed out, not alone adds greatly to the value and completeness of the Garden's collections of living plants and of museum and herbarium specimens, but also to botanical knowledge, and supplies plants and specimens greatly needed in the preparation of the monographs for "North American Flora," now in course of publication by the Garden.

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* See Journal N. Y. Bot. Garden: 9 : 81–90.

† See Journal N. Y. Bot. Garden 9 : 149–158.

‡ See Journal N. Y. Bot. Garden 9 : 135–141.

Investigations

During such time as their curatorial and other administrative work has permitted, members of the staff have carried on original studies in a great variety of subjects, and many of the results reached have been published. Investigations have also been carried on by students and by visiting officials of other institutions, the collections of the Garden affording excellent opportunities for such work. Much of the original study accomplished by the curators has been prosecuted outside of their regular hours of attendance. In the reports of the several officers hereto appended, accounts will be found of the various investigations undertaken during the year, and a record of the publications issued by the Garden during the year will be found in the report of the Assistant Director. These publications have been aided by the income of the David Lydig Fund bequeathed by the late Judge Charles P. Daly.

Research Scholarships

Continuing the policy of previous years, small grants have been made to deserving students to assist them in the prosecution of investigations, $50 a month being so allotted during residence. Considerably larger sums than those appropriated for this purpose up to the present time, could be used to great advantage to botanical science.

For the continuation of. their studies on the North American species of rusts (Uredinales), fungi, many of great destructiveness to other plants, Professor J. C. Arthur, of Purdue University, and Mr. Frank D. Kern, of the same institution, were awarded such scholarships for the month of January. The results of their studies are embodied in two parts of "North American Flora" already published.

Mr. W. W. Eggleston was awarded a scholarship for two months in the spring to enable him to prosecute studies on the North American thorns, genus *Crataegus*, looking forward to a publication of a monograph of this group in "North American Flora." His studies greatly increased the value of the herbarium collection of specimens of this genus, which was also largely increased by specimens contributed by him. Professor Guy West Wilson, a former student of the Garden, now professor of biology in the Upper Iowa University, was given a scholarship in July, to aid in his investigations of several minute fungi.

Preservation of Native Plants

The income of the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants has been allowed to accumulate during the past year, looking forward to the use of two years' income in 1909. The desirability of the protection of natural woodlands has been emphasized from time to time by members of the staff, as occasions have presented themselves.

Police Protection

Under the Charter of the Garden, the policing of the grounds is referred to the Park Department of the City, but this department has hitherto been unable to secure any details of officers for the Garden; the grounds have been partially covered by one patrolman, but this amount of protection is at times quite insufficient for the control of crowds, and considerable damage has been done from time to time by the breaking of shrubs and other depredations. To supplement this meager police protection we have had one keeper, sworn in as a special patrolman, on guard, and two foremen are also special officers, one being on duty every other Sunday. Our head steam engineer is also a special officer.

Administrative

Dr. William A. Murrill, Assistant Director, has had charge of the details of maintenance, acting under my general instructions, and we have been aided in this work by Mr. Percy Wilson, Administrative Assistant. We have thus kept a close watch on all maintenance work. I have taken immediate charge of the oversight and direction of all construction operations and of the increase of the collections, and such time as could be spared from administrative duties has been given to the preparation of manuscript for "North American Flora" and to studies of the plants of the West Indies, those of the Bahamas, and of Jamaica in particular. I have also continued studies of Cactaceae in coöperation with Dr. J. N. Rose, of the United States National Museum.

Financial Considerations

The city allowance for maintenance of the Garden has been increased from $75,000 in 1908 to $79,520 for 1909, an increase of $4,520; this is, however, insufficient to maintain the institution in its present state of development and I recommend that the sum of $13,480 be added to this from Garden income, so as to have $93,000 in all available for maintenance in 1909. This will not permit taking any considerable amount of additional land under high cultivation, nor the keeping of the grounds and collections up as critically as would be possible if a larger allowance were available. The total Garden income, other than that received from the city, is about $28,000, of which only a little more than one half will thus be available for educational purposes and for the increase of the collections. Taking the city appropriation and the Garden income together, the total income for 1909 will be about $107,520. As stated in my last annual report, a wholly satisfactory maintenance of the institution, a proper increase of the collections, and the further development of educational work desired, would cost in all about $125,000. It thus appears that about $17,500 additional income is desirable to enable the Garden to take complete advantage of its great opportunities.

Reports Appended

Appended are also reports by the Assistant Director, the Head Curator of the Museums and Herbarium, the Honorary Curator of the Economic Collections, the Director of the Laboratories, the Librarian, the Head Gardener, and the Superintendent of Grounds, and a schedule of expenditures under appropriations made by the Board of Managers.

Respectfully submitted,
N. L. BRITTON,
Director-in-Chief.

REPORT OF THE ASSISTANT DIRECTOR

To the Director-in-Chief:

Sir: I have the honor to submit the following report for the year 1908.

Grounds

The grounds, and the buildings as well, have been maintained during the year as economically as was consistent with efficiency.

The roads and paths through the grounds are under the care of the Park Department, but the borders, guard rails, water mains, and other matters connected with the lines of traffic, have received due attention from our own employees, as detailed in the report of the superintendent.

Special attention has been given to the removal of dead and unsightly trees and branches along the roads and paths and on the lawns. In addition to the usual spring pruning, the maple trees and the younger trees and shrubs in the collections were pruned in late summer and early autumn. Many shrubs have been added to the collections during the year, and many of the decorative clumps of shrubs have been rearranged. The condition of the plantations is very satisfactory.

The past season was a very trying one on plants in this locality. During the month of May the rainfall was heavy, reaching 7.36 inches, and this was succeeded by a severe and prolonged drought of six weeks or more. The weather of late summer and autumn was rather dry, on the whole, although 6 inches of rain fell during the week beginning August 22; and the first conspicuous film of ice appeared on shallow ponds on November 14.

The chestnut canker has continued its ravages with unabated virulence, and no remedy for this disease has been discovered. All of the chestnut trees on the grounds have been either killed or seriously damaged by it and those in conspicuous places have been removed. The rest will be cut as rapidly as the wood can be used.

Leaf blight appeared on the plane-trees in the spring, but did little damage. Several young conifers near the conservatories died, but those in front of the museum building were in better condition than in former years. Many of the shrubs planted last spring were saved during the drought only by regular and continued watering.

The rose bushes west of the museum building were distributed to various parts of the grounds, and the space filled n with decorative shrubs of larger size.

Systematic spraying for scale insects of various kinds has been continued with excellent results. The lakes have been kept free of algae by the use of copper sulfate, and the usual war has been waged against mosquitoes by applying kerosene to the surface of catch basins and ponds, the latter being also stocked with fish that feed upon the larvae. The middle lake, planted with water lilies, was badly infested during the summer with a species of *Potamogeton?* which developed very rapidly and had to be removed several times.

It gives me pleasure to report that no losses of consequence have occurred through fire, hail, flood, severe cold, or violent storms. Special fire patrols were employed for a time in the hemlock grove when the danger was greatest, and the men employed to pick up papers and other rubbish on Sunday afternoons were specially instructed to assist the regular patrols in guarding against fire.

To prevent the formation of additional trails in the hemlock grove and the consequent damage to the roots of the trees by trampling, large framed signs were placed at principal entrances to the grove with the following instructions: "This grove is situated near the southern limit of the region in which hemlock trees grow naturally near the coast, and its preservation is a matter of special interest. As the roots of the hemlock trees are near the surface of the ground and the soil is thin, trampling over the ground may cause the death of the trees. Visitors are therefore requested to keep to the paths and trails and to abstain from injuring the trees in any way. If this caution is not observed the use of the forest will have to be materially restricted."

The system of regular guides was discontinued late in the year and the work distributed among certain members of the staff and their assistants. The large increase of roads and paths during the year has rendered access to various portions of the grounds comparatively easy without guidance, and visitors have apparently taken more interest in the collections than ever before. It was necessary to construct twenty rustic benches for the paths recently opened.

The picking of flowers and the breaking of branches by lawless visitors has continued, but there has been only one serious attempt at robbery on an extensive scale. Only four arrests were made during the year.

Buildings

MUSEUM

Considerable work has been done on the exterior of the museum building during the year. The roof over the morphological laboratory and at several other points was repaired, the wood-work of the windows painted and new weather strips put on, and some of the brick-work pointed up. The painting of the interior was begun on the first and second floors, and this is still in progress.

By shifting the physiological apparatus, an office for Mr. Seaver, the new director of the laboratories, was arranged for in the large room with Dr. Hollick. This was desirable because of its proximity to the mycological herbarium, where much of Mr. Seaver's time will be spent.

CONSERVATORIES

The public conservatories have been painted on the outside, and it is planned to paint the interior next summer. The condition of the conservatory collections is very satisfactory. The Ames collection of orchids has attracted much attention, and the customary crowds of visitors have been noticed about the cacti, water lilies, and flower beds on the south and north sides of the conservatory range.

A new boiler was installed at the propagating houses in the autumn. The large quantity of chestnut wood taken from the grounds is being used for heating these houses, except in severe weather. The roof and all of the interior, except in house no. 6, was painted during the year. The condition of the plants here and in the adjoining herbaceous garden and nursery is very satisfactory.

OTHER BUILDINGS

The heating and power plant is in excellent condition. The roof and east wall of the power house have been repaired, and all the iron and wood-work painted. All coal received is now weighed on the grounds. The amount of coal consumed was rather less than usual on account of the late fall.

The stable and stable fence have been painted and the floor and approaches repaired. One additional work horse has been purchased. The stable machinery is in good repair.

Publications

JOURNAL

The journal has been published each month during the year, making a volume of 242 pages with 55 plates and 39 figures. A series of articles descriptive of the museum and herbarium collections of the Garden appeared in the January, February, July, October and December numbers. Attention is also called to the list of registered investigators at the Garden from 1897 to 1908, which constitutes the April number.

BULLETIN

Bulletin no. 19, with 114 pages, was issued February 24, 1908. This number contains the annual reports of the Director-in-Chief, First Assistant, Head Curator of the Museums and Herbarium, Honorary Curator of the Economic Collections, Director of the Laboratories, Librarian, Head Gardener, Superintendent of Grounds, Scientific Directors, Committee on Patrons, Fellows and Members, and Treasurer.

CONTRIBUTIONS

Contributions by members of the staff or students of the Garden, reprinted during the year from other than Garden publications, are as follows:

No. 100. Scandinavians Who Have Contributed to the Knowledge of the Flora of North America, by Per Axel Rydberg.

No. 101. Phycological Studies — III. Further Notes on Halimeda and Avrainvillea, by Marshall Avery Howe.

No. 102. Mosses from Tropical America, by Robert Statham Williams.

No. 103. *Alabastra philippinensia*, by Charles Budd Robinson.

No. 104. Studies in the North American Convolvulaceae — IV. The Genus *Exogonium*, by Homer Doliver House.

No. 105. The Taxonomic Aspect of the Species Question, by Nathaniel Lord Britton.

No. 106. The Genus *Ernodea:* A Study of Species and Races, by Nathaniel Lord Britton.

No. 107. Further Studies of Solution Tension and Toxicity in Lipolysis, by Raymond H. Pond.

No. 108. Studies of West Indian Plants — I, by Nathaniel Lord Britton.

No. 109. A Study of the Digestive Power of *Sarracenia purpurea*, by Winifred J. Robinson.

No. 110. Additional Philippine Polyporaceae, by William Alphonso Murrill.

No. 111. Boleti from Western North Carolina, by William Alphonso Murrill.

No. 112. Notes on *Philotria*, by Per Axel Rydberg.

No. 113. Some Notes on Chemical Composition and Toxicity of *Ibervillea Sonorae*, by Julia T. Emerson and William H. Welker.

No. 114. The Boleti of the Frost Herbarium, by William A. Murrill.

No. 115. Some North Dakota Hypocreales, by Fred J. Seaver.

No. 116. Notes on Rosaceae, by Per Axel Rydberg.

No. 117. Studies in North American Peronosporales—IV. Host Index, by Guy West Wilson.

NORTH AMERICAN FLORA

This work, designed to include descriptions of all known plants native to North America, Central America and the West Indies, is being issued in parts at irregular intervals as rapidly as these parts can be prepared.

Volume 9, part 2, by W. A. Murrill, completing the Polyporaceae, was issued March 12, 1908.

Volume 22, part 3, containing descriptions of the Family Grossulariaceae by F. V. Coville and N. L. Britton, the Plantanaceae by H. A. Gleason, the Crossosomataceae by J. K. Small, the Connaraceae by N. L. Britton, the Calycanthaceae by C. L. Pollard, and the Rosaceae (pars) by P. A. Rydberg, was issued June 12, 1908.

Volume 22, part 4, containing descriptions of the Family Rosaceae (pars) by P. A. Rydberg, was issued November 20, 1908.

Lectures

PUBLIC LECTURES

Two courses of illustrated public lectures on botanical subjects have been given in the museum building on Saturday afternoons, as follows:

May 2. "Botanical Expedition to Jamaica," by Dr. Arthur Hollick.

May 9. "Early-Flowering Trees and Shrubs," by Dr. N. L. Britton.

May 16. "Plant Life of the Sea," by Dr. M. A. Howe.

May 23. "Ornamental Shrubs; Their Selection and Arrangement," by Mr. G. V. Nash.

May 30. "Plants that Feed on Insects," by Dr. C. S. Gager.

June 6. "Adulterants in Foods and Drugs and their Detection," by Dr. H. H. Rusby.

October 17. "Edible and Poisonous Mushrooms," by Dr. W. A. Murrill.

October 24. "Wild Autumnal Flowers and Fruits," by Dr. N. L. Britton.

October 31. "Letchworth Park and the Falls of the Genesee," by Mr. G. V. Nash.

November 7. "Plant Distribution as Interpreted by Geology," by Dr. Arthur Hollick.

November 14. "Botanical Cruises in the Bahamas," by Dr. M. A. Howe.

November 21. "The Rubber Plants of Mexico," by Dr. H. H. Rusby.

SCHOOL LECTURES

The usual series of lectures and demonstrations to the public school children of the 4B and 5B grades, of the Borough of the Bronx, was given in spring and autumn, under the auspices of the Board of Education in connection with the nature study work of the schools; over 20,000 children, accompanied by their teachers, attended these exercises.

Grade 4B

Lecture I, "Cultivation of Plants," by Mr. George V. Nash, was given to groups of pupils on April 24, April 30, May 1, October 13, October 15, and October 16.

Lecture II, "Seedless Plants," by Dr. Marshall A. Howe, on May 11, May 12, May 19, October 29, November 5, and November 10.

Grade 5B

Lecture I, "Industries Depending on Forests. Plant Products," by Dr. H. H. Rusby, on April 20, April 21, April 28, October 27, October 30, and November 6.

Lecture II, "Woody Plants and Plants without Wood. Protection of Trees in Cities," by Dr. C. S. Gager in the spring and Mr. F. J. Seaver in the fall, on May 5, May 8, May 14, October 6, October 8, and October 9.

Lecture III, "Classification of Plants," by N. L. Britton, on May 21, May 22, May 25, October 20, October 22, and October 23.

SCIENTIFIC MEETINGS

The botanical conventions, held in the library on Wednesday afternoons, have been interesting and generally well attended. On account of the number of meetings of a botanical nature held in the city during the collegiate year, it has been thought advisable to hold these conventions monthly instead of semi-monthly hereafter. A list of the chief topics discussed at the conventions of the past year is as follows:

January 8. "An Account of the Preparation of a Monograph on the Cretaceous Flora of Southern New York and New England," by Dr. Arthur Hollick; "Reports of the Chicago Meeting," by Dr. J. C. Arthur, Dr. T. E. Hazen, and Mr. F. D. Kern.

January 22. "Botanical Exploration of the Eastern Bahamas," by Dr. M. A. Howe and Mr. Percy Wilson.

February 5. "The Taxonomic Aspect of the Species Question," by Dr. N. L. Britton; "Review of Paul Becquerel's 'Recherches sur la Vie latente des Graines,'" by Dr. C. S. Gager.

April 1. "Histological Effects of Exposure to Radium-rays," by Dr. C. S. Gager; "Some Unusual Orchids," by Mr. G. V. Nash; "Review of Goebel's 'Brutknospen Bildung bei *Drosera pygmaea* und einigen Monocotylen,'" by Miss W. J. Robinson.

November 4. "A Recent Trip to Jamaica," by Mrs. N. L. Britton; "An Interesting Analogy," by E. W. Humphreys; "Notes on Some North Dakota Fungi," by F. J. Seaver.

December 2. "Recent Paleobotanical Notes and Literature," by Dr. Arthur Hollick; "The Mycorhiza Problem," by Mr. B. C. Gruenberg; "Educational Organization of Nature Study," by Miss M. P. Anderson.

The Torrey Botanical Club has held its usual monthly meetings on Wednesday afternoons during the year in the morphological laboratory of the museum building.

The Horticultural Society of New York held its annual meeting and exhibition in the museum building on May 13 and 14; and its summer exhibition on June 10 and 11. On June 10 there was a joint meeting of this society and the American Rose Society.

The Brooklyn Institute of Arts and Sciences held a field meeting at the Garden on October 3 for the benefit of the members of its department of botany.

Personal Investigations

My own investigations during the year have dealt chiefly with the Boletaceae, a difficult family of fleshy pore-bearing fungi closely related to the Polyporaceae, and this group is now nearly ready for publication in "North American Flora."

Type material and a large number of duplicate specimens have been examined at Albany, Cambridge, Washington and elsewhere, and the entire collections representing the Boletaceae at the University of Vermont, where the Frost herbarium is deposited, at Cornell University, and at the Missouri Botanical Garden, have been most generously loaned me for study. The private collections of Mr. C. C. Hanmer, of East Hartford, Connecticut, Dr. N. M. Glatfelter, of St. Louis, Missouri, and several others have also been kindly placed at my disposal. While at Biltmore I obtained many fresh specimens of these plants with field notes, to supplement my collections of former years in Maine, New York, District of Columbia, Virginia, Tennessee and elsewhere.

My publications on this subject during the year are as follows: "Collecting and Studying Boleti," Torreya 8: 50–55. 1908, "Notes on the Life and Work of Charles C. Frost," Torreya 8: 197–200. 1908, "Boleti from Western North Carolina," Torreya 8: 209–217. 1908, and "The Boleti of the Frost Herbarium," Bull. Torrey Club **35**: 517–526. *pl. 36–40.* 1908. The last two were reprinted as Garden Contributions Nos. 111 and 114.

The remaining portion of my monograph of the Polyporaceae appeared March 12, 1908, as Vol. 9, part 2, of "North

American Flora." The last of the keys to species occurring in temperate regions of North America appeared in Torreya for January, February, and June. A very large and valuable collection of woody fungi from the Philippine Islands was received early in the year, which was found to contain about forty undescribed species of polypores. A detailed report on this collection appeared in the Torrey Bulletin for August under the title "Additional Philippine Polyporaceae," which was reprinted as Garden Contribution No. 110. Field studies of polypores were made during a vacation of three days spent in the Adirondacks early in July, and while at Biltmore during the latter half of July.

The chestnut canker has demanded considerable attention during the year, especially in the form of correspondence and personal interviews. I published further articles on this subject in the JOURNAL of the Garden for February, Torreya for May, and Suburban Life for January [issued in December]. The reappearance of the leaf blight on the plane-tree last spring led me to publish a brief account of this disease in the June JOURNAL.

General work on fungi in the herbarium has gone forward as usual during the year. The collections of fungi in the museum and herbarium were described somewhat at length in the JOURNAL of the Garden for January, 1908. The most important additions were those from the Philippines, and from my own collections at Biltmore, North Carolina, an account of which appeared in the JOURNAL of the Garden for August. For two weeks in July I was the guest of Dr. C. A. Schenck, forester of the Vanderbilt estate, and enjoyed unusual opportunities for the study and collection of fungi. During my stay at Biltmore I gave ten lectures on wood-destroying species before the Biltmore Forest School.

Returning to New York in August, a study of local species was begun with special reference to illustrating the principal conspicuous forms in this vicinity. A lecture on edible and poisonous species was given in the regular autumn course, in which many of these illustrations were used in the form of lantern slides. An article on this subject, accompanied by several colored illustrations, was written for the Garden JOURNAL for December.

On December 5, I left New York for Jamaica in order to make a special study of the fungi of that island. A general report of my explorations there will appear in the JOURNAL of the Garden for February.

Respectfully submitted,
W. A. MURRILL,
Assistant Director.

REPORT OF THE HEAD CURATOR OF THE MUSEUMS AND HERBARIUM

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1908.

The collections under my care have been enlarged and conserved mainly as during previous years, and all specimens, both of the public exhibits and those of the study collections, are in good condition.

Accessions

The additions to the collections may be itemized as follows:

(*a*) *Purchase.* Specimens from nearly all parts of the eastern and western continents, aggregating 32,910, were acquired.

(*b*) *Gift.* Various specimens, chiefly from Europe and America, aggregating 1,703 were presented to the institution.

(*c*) *Exchange.* A total of 2,941 specimens from nearly all parts of the world were secured in exchange for duplicate material.

(*d*) *Exploration.* Fully 19,080 specimens were brought together by members of the Garden staff, from temperate and tropical North America.

The total number of specimens accessioned during the year is 56,634.

Museums

The arrangement of the exhibits of the Economic Museum, and the Synoptic Collection, the Local Flora and the Microscope Exhibit in the Systematic Museum was not materially changed, except for the interpolation of specimens here and there and the transfer of several exhibits in the west wing of the Economic Museum. The collections of fungi, mosses and hepatics, algae, and flowering plants, were described respectively in the January, February, July and October numbers of the Journal.

The additions made just previous to the beginning of this year to the case equipment of the Fossil Plant Museum in the basement necessitated a complete rearrangement of that collection, bringing about the doubling in size of the public exhibit of fossil plants, so that now four table cases are devoted to the plant-remains of Paleozoic time, instead of two as heretofore; five similar cases include plant-remains of Mesozoic time, instead of three, and three cases contain the remains of plants of Neozoic time as compared with the one in the former arrangement. A complete description of the arrangement and scope of the collections included in this museum was published in the December JOURNAL.

Two very important additions were presented to the Economic Museum, namely, a collection of between one and two hundred specimens representing the sources of various plant constituents, and a collection of several hundred specimens of varnish resins. The former is being installed with the plant constituents in the west wing of the Museum, while the latter is being studied preparatory to labeling. The accumulated specimens illustrating the trunks of trees, secured on several former expeditions to tropical America, have been sawed into uniform sizes and otherwise prepared, and are being installed in the exhibition cases, and progress is being made in the installation of general museum material. During the year such specimens as could not be used in our permanent collections were given to the public schools of the city or sent as exchanges to other institutions.

Herbaria

The more important additions to these collections was the Kuntze herbarium, consisting of plants from all parts of the globe, purchased by money given by Mr. Andrew Carnegie, and the specimens secured by exploration in insular and continental tropical America, the larger accessions coming from Panama, the Bahamas, Jamaica and Bermuda.

From the specimens secured during the year and from the accumulation of those acquired during former years, about

34,000 were selected, mounted and distributed in the permanent collection. These were mounted on 25,524 sheets of herbarium paper, and include several hundred specimens presented to the Columbia University herbarium. In addition to the above about 600 bulky specimens were placed in the several sizes of multiple paper boxes.

The cases containing the specimens of algae were moved from the room adjoining the library on the west, to the adjacent room, in order to allow for the growth of the library.

The exotic specimens of angiosperms, including all from without the area included in "North American Flora" were arranged alphabetically and separated geographically in covers as follows: South America, Europe, Asia, Africa, Australia and Oceanica; by this arrangement the specimens are readily found for reference.

Considerable time was devoted during the latter part of the year to ascertaining the condition of preservation of all herbarium specimens of ferns and flowering plants; every bundle of specimens was looked over and a few instances of insect depredation were found, but no material damage had been done.

From time to time specimens were selected from our accumulation of duplicates and sent as exchanges to other institutions. The total number of specimens sent in exchange was 4,793.

Assistance and Investigations

Dr. William A. Murrill, Assistant Director, looked after the conservation and development of the fungal collections. (For further details see report of the Assistant Director.) Mr. Fred. J. Seaver, Director of the Laboratories, has also done much work on these collections during the latter part of the year.

Dr. Marshall A. Howe, Curator, has chiefly conserved the collections of algae and hepatics. He has continued his studies of the marine algae, particularly of the West Indian region, and has prepared a monographic account of the species of *Neomeris* of the world. Dr. Howe served during the year as editor of the Torrey Botanical Club, having special charge of its BULLETIN and MEMOIRS ; he assisted in the nature study courses given at the Garden in coöperation with the public schools of the city and carried on exploration in the lower Bahama Islands.

Dr. P. A. Rydberg, Curator, has chiefly had charge of the general herbarium of flowering plants. He has continued his studies on the plants of western North America, particularly in connection with the preparation of a Flora of the Rocky Mountain Region, and studied the genus *Rubus* in the field from New York to North Carolina and Tennessee. Fully one half of Dr. Rydberg's monograph of Rosaceae was printed in Volume 22 of "North American Flora," and he has prepared monographs of the Sparganiaceae, Elodeaceae, Hydrocharitaceae, Balsaminaceae and Limnanthaceae for the same work. He also printed two papers in the Bulletin of the Torrey Botanical Club.

Dr. Arthur Hollick, Curator, has had charge mainly of the collection of fossil plants. The additional exhibition and storage cases entailed a complete rearrangement of all specimens, both exhibition and study, and the additional room made ready access possible to specimens formerly in storage, and also made possible the cataloguing of the numerous type specimens. In this work Dr. Hollick received the voluntary assistance of Mr. Edwin W. Humphreys. During the year Dr. Hollick has edited the BULLETIN of the Garden and written several papers on paleontological subjects.

Mr. R. S. Williams, Assistant Curator, spent the first part of the year in the exploration of Panama, whence he brought back a very valuable collection of herbarium specimens; while not in the field, he has devoted his time principally to the development of the collection of lichens and mosses and has prepared the manuscript of several genera and families for a forthcoming part of "North American Flora."

Mr. W. R. Maxon, of the United States National Museum, served as an Assistant Curator during December, working on the fern collection.

Mrs. N. L. Britton voluntarily directed the development of the moss collections, devoting much time to the naming and conserving of the large accumulation of specimens and to collecting in Jamaica. She has also prepared several monographs for a forthcoming part of "North American Flora."

Dr. J. A. Shafer, Museum Custodian, has been occupied in the preparation and care of the permanent collections, and the care of the museum building; he has also studied the plants he collected a few years ago on Montserrat, West Indies, and has prosecuted studies on the North American tree-flora, and made special collections for the exhibit of North American Dendrology.

The writer, in addition to the details involved in curatorial duties, devoted time to monographic work on the Alismaceae, Malpighiaceae and several minor groups for "North American Flora." I have also made much progress in my studies of the flora of the southeastern United States, particularly as relates to the native and exotic flora of Florida, and the relation of the flora of the Florida Keys, the Everglade Keys and West Indies.

The curators have been assisted by eight museum aids and by five janitors.

Respectfully submitted,
J. K. Small,
Head Curator of the Museums and Herbarium.

REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTION

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1908.

Five hundred specimens have been added to the economic collection during the year, a number of which are of particular interest and value.

Messrs. Merck & Co. have contributed a collection of 120 plant products which represent the sources of most of the plant principles previously donated by them. A description of this donation was printed in the August number of the Journal. The entire collection in now exhibited in one set of cases, the several proximate principles being grouped about the crude substances from which they are respectively derived. This exhibit constitutes one of the most highly instructive features of this museum.

It is a very interesting fact that the same year that marks the complete installation of this important study-collection of products of living plants should bring to us a nearly complete collection of varnish resins, most of them fossils. This is the gift of Mr. A. P. Bjerregaard, of Mineola, N. Y., and comprises 212 specimens. Not only is nearly every variety of varnish-resin included, but most of them are represented by an extended series of specimens.

The economic collections made for us by Messrs. Weiss & Schmidt, on the upper Rio Negro, referred to in my last report, numbering fifty museum-specimens, with the accompanying herbarium material, have been received. We have not as yet been able to study these specimens, and cannot now report upon their economic value.

A lecture was delivered in our spring course on "Adulterants in Foods and Drugs." A collection of such adulterated articles has been commenced, some 30 specimens of powdered drugs having been obtained. Special efforts will be made to accumulate these articles without delay, as they are likely to occur in commerce far less frequently in the future than has been the case in the past, while many forms of adulteration will doubtless wholly disappear. Dr. Wiley's energetic and conscientious enforcement of the federal food and drugs act bids fair, within a short time, to place our medicinal and food supplies upon a basis of purity which could not have been anticipated a few years ago.

Among the miscellaneous acquisitions of the year, there is an usual percentage of rare or uncommon specimens, and this is particularly true in the drug department.

A matter of exceptional interest has been the receipt of specimens of a new rubber-yielding tree of the Mexican foothills, the investigation of which occupied me during the late summer and fall.

In connection with the above mentioned investigation, a small collection of rare Mexican fruits and other economic products was obtained for the Museum.

Late in the year, Mr. Mackie, of this city, presented us with an interesting collection of American-grown tobaccos, which were exhibited at the Crystal Palace in this city in 1853.

A number of the descriptive labels which have been from time to time referred to in these reports have now been placed in the cases, and have proved their great value as an aid to visitors. As an indication of what these labels are intended to accomplish, I present herewith two illustrations, contrasting each with the ordinary form of label accompanying our specimens.

ORDINARY SPECIMEN LABELS

CORN STARCH

The fecula of the seed of *Zea Mays* L.
Fam. Gramineae Grass Family
Native of tropical America and widely cultivated.

PARA RUBBER   ELASTICA
The concrete milky exudation obtained from the bark of various species of *Hevea*
Fam. Euphorbiaceae   Spurge Family
Native of Brazil and cultivated.

DESCRIPTIVE LABELS

STARCH

Starch is manufactured by most plants, as a reserve food supply, from the water taken in through the roots and the carbonic acid gas inhaled from the atmosphere; the chemical combination is effected by the sun's energy, directed by the green coloring matter (chlorophyll). Starch is mostly stored in the form of granules, sometimes in small rods, and is easily converted by the plant, or artificially, into glucose, in which form the plant consumes it. In darkness the plant consumes starch previously formed in daylight. Starch is insoluble in water and can therefore be easily washed out from ground plant tissue. The forms of the starch grains are so constant and characteristic in each plant that they afford an excellent method of identifying the latter, even in powder.

RUBBER

Elastica, U. S. Pharmacopoeia

Rubber, India rubber, or Elastica consists chiefly of the peculiar substance caoutchouc, which, in the form of an emulsion, constitutes the milky juices of many plants, existing in special milk-tubes of the bark and wood. The bark is cut or punctured, when the milk exudes and is caught in some receptacle. It may also be obtained by grinding up the bark, leaves and other parts and extracting with petroleum, bisulphide of carbon or other solvent. The milk is coagulated by various methods, mostly by subjecting it to the action of smoke, and the coagulated mass, often losing water by slow evaporation, takes on the dark color, toughness and elasticity characteristic of rubber. Rubber is more valuable in proportion as its percentage of caoutchouc is greater, and that of its resin less.

It is proposed during the coming year to largely extend this feature of our labeling.

It is believed that the steady extension of our work along the lines now being operated will fully occupy us during the year to come.

The most important need of this department at the present time is a liberal supply of containers, of suitable sizes, so that specimens may be installed as fast as received. Owing to the fact that the glass manufacturers suspend operations during the hot summer months this matter should receive early attention.

Respectfully submitted,
H. H. Rusby,
Honorary Curator of the Economic Collection.

REPORT OF THE DIRECTOR OF THE LABORATORIES

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1908.

During the greater part of the year the laboratories were under the supervision of Dr. C. S. Gager, assisted by Miss Winifred J. Robinson, the former having left the institution in August,* and the latter on September 5, 1908. My own duties as director of laboratories were assumed on September 5, and thus far the work has been carried on without special assistance.

With the permission of the Garden, the experimental work on primroses, which had been conducted by Dr. Gager during the year, was allowed to continue through the growing season and collections of seeds and other materials sent to him in the autumn in order that this experimental work, which must be continued through several seasons, might be carried on to its completion.

On taking up my duties here, the laboratories, laboratory equipment and student records were found in good condition, and since that time no important changes have been made. However, some minor changes were made necessary by the expansion of the herbarium of cryptogamic botany and the consequent crowding of the laboratories into smaller quarters. The office formerly used by Dr. Gager is now occupied by Dr. Howe in order that he might be conveniently located with reference to the collections of algae, which have been transferred to the main laboratory. My own office has been arranged in a part of the room occupied also by Dr. Hollick, and is thus brought adjacent to the collections of fungi which are now installed in the room formerly used as a physiological laboratory.

Some minor changes have also been made in the other laboratory rooms. The dark room has been converted into a store room and equipped with temporary shelving which has, up to this time, been used in the chemical laboratory. In this room are stored materials in quantity and large pieces of apparatus which are not in immediate use. This arrangement has made it possible to place several student desks in the chemical laboratory which are designed to be used by students carrying on work in physiological chemistry, culture work with the fungi, and those phases of cytological work which necessitate the use of the paraffine bath or other pieces of apparatus requiring a constant flame.

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* Resigned to accept professorship of botany in Missouri State University.

Numerous small pieces of apparatus and reagents have been added to the laboratory equipment during the year, but no large or expensive pieces have been purchased. The addition of materials of this kind, even in small quantities, emphasizes the need of more cases for the storage of such material as well as of more room for the installment of cases.

According to your request, beginning with November, a programme has been arranged to be given before the conference of the scientific staff and students of the Garden on the first Wednesday of each month, the minutes of the meetings recorded, and a synopsis of each paper prepared for publication in the JOURNAL of the Garden.

Meteorological records have been kept during the entire year and in addition to these evaporimeter records have been kept during that part of the season favorable for conducting this kind of experimental work. The evaporimeter records were kept in one station located near the propagating house and continued until danger of frost made it necessary to take up the instruments for the winter. This work has been carried on in coöperation with the Desert Botanical Laboratory of Tucson, Arizona, and its object fully explained in previous reports. The results of these experiments have been published in full by the Carnegie Institution.

The minimum temperature recorded for the year was 0.5° on February 5, and the maximum temperature 99.5° on July 19 and 20. The mean temperature for the year was 50°. The autumn was unusually warm and dry, the precipitation recorded for November being less than .5 of an inch. This was in part counterbalanced by a number of very light showers and fogs which served to keep the surface of the soil moist. The total precipitation for the year was 37.46 inches. The first fall frosts occurred about the middle of October.

My own investigations which are, in the main, a continuation of the work begun while a student at the Botanical Garden during the season of 1906 to 1907, are directed along two lines.

1. A systematic study of various groups of fungi known as the ascomycetes, with a critical study of some of the more limited groups.

2. Investigations of the life-histories of some of the little known forms, many of which are associated with diseases of the higher plants.

In addition to the more general work on the study of the ascomycetes, critical study is at present being carried on with one order, the Hypocreales, a monograph of which order is well under way. Unusual advantages are afforded for carrying on this work at the Garden on account of the large number of types which are contained, especially in the Ellis collection in this institution. But notwithstanding the great advantages, some difficulties have presented themselves. Many of the types are contained in other herbaria, of which we have been unable to secure duplicates and before the work can be made thorough and complete it will be necessary to refer to types in a number of herbaria, among which are the Schweinitz collection at Philadelphia, the herbarium of the State Museum of Natural History at Albany and the extensive collections in the cryptogamic herbarium at Harvard University. Through the influence of the late Professor L. M. Underwood, we have been able to secure cotype specimens of a number of North American species contained in the herbarium at Kew, and in the case of thirteen species which were too scant to divide, careful pencil sketches and notes have been prepared which become the property of the New York Botanical Garden and which have aided much in this work.

Material is also being accumulated for carrying on a series of experiments in the culture and artificial inoculation of certain species of the order mentioned, with the hope of gaining information concerning their life-histories. Many of the ascomycetes are connected in their life-histories with certain of the so-called imperfect fungi and very careful and critical study is necessary in order to determine this relationship in the various species.

A total of twenty-four persons have carried on investigations at or in connection with the Garden for periods ranging from a few days to the entire year. In addition to this number numerous individuals have visited the libraries and herbaria for the purpose of looking up smaller items of information, such persons not being included in the list of investigators.

Investigators registered before January 1, 1908	10
Registered since January 1, 1908	12
Total number registered	22
Deduct for names counted twice	6
Number of persons registered	16
Investigators not registered	8
Total number of investigators	24

Below is a list of the names of students and investigators who have carried on work at the Garden during the past year, together with their academic training for research, subjects pursued while resident at the Garden, and the present or last position held.

* Anderson, Mary Perle. B.S., Mt. Holyoke, 90; Mass. Inst. Technology, 97–98; Univ. of Chicago, 02–03; N. Y. Bot. Garden, 07–. Teacher of Nature Study, Horace Mann School, Teachers Coll., Columbia Univ.

Geographical distribution of the ferns of Japan.

† Arthur, Joseph Charles. B.S., Iowa State Coll., 72; M.S., 77; Sc.D., Cornell Univ., 86; Johns Hopkins Univ., 78–79; Harvard Univ., 79; N. Y. Bot. Garden, 03, 04, Research scholar, 06, 07 and 08. Professor of Physiology and Pathology, Purdue Univ., and Botanist to the Indiana Exp. Station.

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* Registered at Columbia.

† Research scholarship.

* BENEDICT, RALPH CURTIS. A.B., Syracuse Univ., 06; Aid, N. Y. Bot. Garden, 06–08; N. Y. Bot. Garden 08–.
Taxonomy of Pteridophytes.

BILLINGS, ELIZABETH. Barnard Coll. (special student), 95; N. Y. Bot. Garden, 02, 03, 04, 05, 06, 08–.
Paleobotany, Taxonomy.

* BRANDENBURG, ELLEN KLAPP. B.S., Columbia Univ., 04; Cold Springs Harbor, 05; Cornell Univ. (summer school) 06; N. Y. Bot. Garden, 07–08. Teacher of Biology and English, High Schools, Washington, D. C.
Morphology of fungi.

BRITTON, MRS. N. L. N. Y. City Normal Coll., 75. Hon. associate instructor in Cryptogamic Botany, Columbia Univ., and Barnard Coll. and unpaid assistant in the N. Y. Bot. Garden.
Anatomy and classification of mosses and ferns.
Mosses of the West Indies, southern Florida and Mexico.

* BURLINGHAM, GERTRUDE SIMMONS. A.B., Syracuse Univ., 96; Ph.D., Columbia Univ., 08; N. Y. Bot. Garden, 05–. Teacher of Biology, Eastern District High School, Brooklyn, N. Y.
Taxonomy of fungi.

* BUTLER, BERTRAM THEODORE. Ph.B., Hamline Univ., 01; A.M., Columbia Univ., 08; N. Y. Bot. Garden, 07–. City Supt. of Schools and Teacher of Science, Glendive, Montana.
Flora of Montana.

* DARLING, CHESTER ARTHUR. A.B., Albion Coll., 04; A.M., 06; N. Y. Bot. Garden, 06–. Assistant in Botany, Columbia Univ.
Cytology and plant physiology.

† EGGLESTON, WILLARD WEBSTER. B.S., Dartmouth, 91; Student, Gray Herb., 97; Biltmore Herb., 07–08; Aid, N. Y. Bot. Garden, 04–07, Research scholar, 08.
Taxonomy of Crataegus.

EMERSON, JULIA TITUS. Coll. Pharm., Columbia, 98; Teachers Coll., Columbia, 98–99; Woods Holl, 99, 01, 03, 04; N. Y. Bot. Garden, 02–04, 04–.
Taxonomy of mosses.

GRUENBERG, BENJAMIN CHARLES. B.S., State Univ. of Minn., 96; A.M., Columbia Univ., 04; N. Y. Univ., 01–02; N. Y.

Bot. Garden, 02–06, 08–. Teacher of Biology, De Witt Clinton High School, N. Y.

The mycorhiza problem.

HUMPHREY, CLARENCE JOHN. A.B. and B.S., State Univ. of Nebraska, 06. Assistant in the department of Botany, Cornell Univ.

Taxonomy of Polyporaceae.

HUMPHREYS, EDWIN WILLIAM. A.B., Coll. of the City of N. Y., 03; A.M., Columbia Univ., 06; N. Y. Bot. Garden, 05–06, and voluntary assistant to Dr. Hollick. Teacher in the Elementary Schools of N. Y. City.

Paleobotany.

JACKSON, HERBERT SPENCER. A.B., Cornell Univ., 05; N. Y. Bot. Garden, 07, 08. Fellow in Botany, Harvard Univ.

Fungi of Delaware.

KUPFER, ELSIE M. A.B., Barnard Coll., Columbia 99; A.M., Columbia, 01; Ph.D., 07; N. Y. Bot. Garden, 01–. Teacher of Biology, Wadleigh High School, N. Y.

Plant physiology.

* KIMURA TOKUZO. A.B., Stanford Univ., 06; Sapporo Agric. Coll., Japan, 03; Columbia Univ., 07–; N. Y. Bot. Garden, 07.

Sex-determination and artificial parthenogenesis.

† KERN, FRANK DUNN. B.S., Iowa State Univ., 04; M.S., Purdue Univ., 07; N. Y. Bot. Garden, 06. Research scholar, 07–08. Assistant Botanist, Indiana Exp. Station.

* HOUSE, HOMER DOLIVER. A.B., Syracuse Univ.. 02; A.M., Columbia Univ., 04; Ph.D., 08; N. Y. Bot. Garden, 02–03; Aid N. Y. Bot. Garden, 07–08. Associate Director of Biltmore Forest School.

Taxonomy.

MILLSPAUGH, CHARLES FREDERICK. M.D., N. Y. Homeop. Med. Coll., 81; N. Y. Bot. Garden, various times, 03–08; Studied in various American and foreign herbaria. Curator, Dept. of Botany, Field Museum Nat. Hist., Chicago.

Systematic botany.

* ROBINSON, WINIFRED JOSEPHINE. B.S. and Ph.B., State Univ. of Michigan, 99; A.M., Columbia Univ., 04; Mich. State Normal Coll., 92; Mich. Agric. Coll., 94; Woods Holl,

99 and 00; N. Y. Bot. Garden, 02–03; Research scholar, 02, 03; Lab. Assistant, 07–08. Instructor in Biology, Vassar Coll., N. Y.

Taxonomy of ferns of the Sandwich Islands.

Life-history of filmy ferns.

Nutrition of Sarracenia and Drosera.

* SAGE, LILLIAN BELLE. A.B., Cornell Univ., 01; N. Y. Bot. Garden, 06–08. Teacher of Biology, Washington Irving High School, N. Y. City.

Taxonomy of mosses (Jamaica.)

TAYLOR, ALEXANDRINA. Special student, Barnard Coll., Columbia Univ.; Assistant, 1890–1895; N. Y. Bot. Garden, 1900.

Taxonomy of mosses.

* WILKINS, LEWANNA. B.S., Wellesley Coll., 01; Woods Holl (Wellesley Coll. Table), 96; C. Hart Merriam's Camp, California, summer, 98; Goettingen, Germany, spring and summer, 01; Chicago Univ. (summer school), 05; Columbia Univ. (summer school), 07; N. Y. Bot. Garden, 07, 08. Teacher of Biology, Eastern High School, Washington, D. C.

† WILSON, GUY WEST. B.S., De Pauw Univ., 02; A.M., 03; M.S., Purdue Univ., 06; Aid, N. Y. Bot. Garden, 06–07, Research scholar, 08. Professor of Biology, Upper Iowa Univ., Fayette, Iowa.

REPORT OF THE LIBRARIAN

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1908.

According to a census of the Library taken at the end of the year, the number of bound volumes was 21,230, an increase of 772 volumes since the last report. Among the accessions were 448 volumes purchased on the account of the special book fund, and 45 received as gifts; the principal accessions have been listed from time to time in the Journal of the Garden.

During the year, 289 volumes have been bound; of this number 33 are the property of Columbia University, on deposit at the Garden.

The number of catalogue cards written during the year is about 4,100. This includes the beginning of series of author and subject reference-cards for the use of the cataloguers.

The appended list shows the periodical and other serial publications received regularly as issued.

Respectfully submitted,
John Hendley Barnhart,
Librarian.

List of Periodicals

* Periodicals subscribed for by the Garden.

† Periodicals subscribed for by Columbia University and deposited at the Garden.

‡ Periodicals received in exchange by the Torrey Botanical Club and deposited at the Garden.

All others are received in exchange by the Garden.

* Académie Internationale de Géographie Botanique, Le Mans, France. *Bulletin.*

Agricultural Experiment Station, Auburn, Ala.
" " " Tuskegee, Ala.
" " " Uniontown, Ala.
" " " Tucson, Ariz.
" " " Fayetteville, Ark.
" " " Berkeley, Calif.

Agricultural Experiment Station, Fort Collins, Colo.
“ “ “ New Haven, Conn.
“ “ “ Storrs, Conn.
“ “ “ Newark, Del.
“ “ “ Gainesville, Fla.
“ “ “ Experiment, Ga.
“ “ “ Honolulu, Hawaii.
“ “ “ Moscow, Idaho.
“ “ “ Urbana, Ill.
“ “ “ Lafayette, Ind.
“ “ “ Ames, Iowa.
“ “ “ Manhattan, Kan.
“ “ “ Lexington, Ky.
“ “ “ Baton Rouge, La.
“ “ “ Orono, Me.
“ “ “ College Park, Md.
“ “ “ Amherst, Mass.
“ “ “ Agricultural College, Mich.
“ “ “ St. Anthony Park, St. Paul, Minn.
“ “ “ Agricultural College, Miss.
“ “ “ Columbia, Mo.
“ “ “ Bozeman, Mont.
“ “ “ Lincoln, Neb.
“ “ “ Reno, Nev.
“ “ “ Durham, N. H.
“ “ “ New Brunswick, N. J.
“ “ “ Mesilla Park, N. Mex.
“ “ “ Geneva, N. Y.
“ “ “ Ithaca, N. Y.
“ “ “ Raleigh, N. C.
“ “ “ Fargo, N. D.
“ “ “ Wooster, Ohio.
“ “ “ Stillwater, Okla.
“ “ “ Corvallis, Oregon.
“ “ “ State College, Pa.
“ “ “ Mayaguez, Porto Rico, W. I.
“ “ “ Kingston, R. I.
“ “ “ Clemson College, S. C.
“ “ “ Brookings, S. Dak.

Agricultural Experiment Station, Knoxville, Tenn.
" " " College Station, Texas.
" " " Logan, Utah.
" " " Burlington, Vt.
" " " Blacksburg, Va.
" " " Morgantown, W. Va.
" " " Pullman, Wash.
" " " Madison, Wis.
" " " Laramie, Wyo.
Agricultural Gazette of New South Wales, Sydney, N. S. W.
Agricultural Journal of India, Calcutta, India.
Agricultural Ledger, Calcutta, India.
Alabama. Geological Survey of Alabama, University, Ala. *Bulletin*, *Report*.
† Allgemeine Botanische Zeitschrift, Karlsruhe, Germany.
Alumni Journal, College of Pharmacy, New York, N. Y.
Amani. Biologisch-Landwirtschaftliches Institut, Bezirk Tanga, Deutsch-Ost-Afrika. *Berichte*.
America. Botanical Society of America. *Publications*.
America. Society of American Florists, Boston, Mass. *Proceedings*.
American Academy of Arts and Sciences, Boston, Mass. *Proceedings*.
American Agriculturist, New York, N. Y.
American Association for the Advancement of Science, Washington, D. C. *Proceedings*.
* American Botanist, Joliet, Ill.
American Florist, Chicago, Ill.
* American Homes and Gardens, New York, N. Y.
American Journal of Pharmacy, Philadelphia, Pa.
American Journal of Science, New Haven, Conn.
American Museum of Natural History, New York, N. Y. *Bulletin*, *Report*.
‡ American Naturalist, Boston, Mass.
American Philosophical Society, Philadelphia, Pa. *Proceedings*.
American Rose Society, New York, N. Y. *Bulletin*.
† Annales des Sciences Naturelles: Botanique; Paris, France.
Annales Mycologici, Berlin, Germany.
Annali di Botanica; see Rome, R. Istituto Botanico.
† Annals of Botany, London, England.

Antwerp. Jardin Botanique, Antwerp, Belgium. *Seed Lists.*

Appalachian Mountain Club, Boston, Mass. *Appalachia.*

Arboriculture: see International Society of Arboriculture.

* Archiv der Pharmazie, Berlin, Germany.

Ardennes. Société d'Histoire Naturelle, Charleville, France. *Bulletin.*

Argentine Republic. Museo de La Plata, Argentina. *Anales.*

Argentine Republic. Sociedad Cientifica Argentina, Buenos Aires, Argentina. *Anales.*

Arkiv för Botanik: see Sweden, Kongliga Svenska Vetenskaps-Akademien.

Asiatic Society of Bengal: see Bengal, Asiatic Society.

Asmara. Ufficio Agrario Sperimentale, Asmara, Colonia Eritrea, N. E. Africa. *L'Agricoltura Coloniale.*

* Association Française pour l'Avancement des Sciences, Paris, France. *Compte Rendu.*

Association pour la Protection des Plantes, Geneva, Switzerland. *Bulletin.*

Audubon Park: see New Orleans.

Bahama Islands. Agricultural Department, Nassau, N. P., Bahamas. *Bulletin.*

Bambou: see Le Bambou.

Basel. Naturforschende Gesellschaft, Basel, Switzerland. *Verhandlungen.*

Bavaria. Bayerische Gesellschaft zur Erforschung der Heimischen Flora, Munich, Bavaria. *Berichte, Mitteilungen.*

* Beiträge zur Wissenschaftlichen Botanik, Stuttgart, Germany.

Belgium. Société Royale de Botanique de Belgique, Brussels, Belgium. *Bulletin.*

Belgrade. Jardin Botanique "Jevremovac," Belgrade, Servia. *Seed Lists.*

Belize. Botanical Garden, Belize, British Honduras, Central America.

Bengal. Asiatic Society of Bengal, Calcutta, India. *Journal.*

Bergianska Trädgården, Stockholm, Sweden. *Acta Horti Bergiani.*

‡ Berlin. Königlicher Botanischer Garten, Berlin, Germany. *Notizblatt.*

Bermuda. Report of the Board of Agriculture, Bermuda, W. I.

Bernice Pauahi Bishop Museum, Honolulu, Hawaii.

† Bibliotheca Botanica, Stuttgart, Germany.
* Biltmore Botanical Studies, Biltmore, N. C.
* Biologisches Centralblatt, Leipzig, Germany.
* Biometrika, London, England.
Bombay. Victoria Gardens, Bombay, India. *Report.*
Boston. Board of Commissioners of Department of Parks, Jamaica Plain, Mass. *Annual Report.*
Boston. Board of Metropolitan Park Commissioners, Boston, Mass. *Report.*
‡ Boston Society of Natural History, Boston, Mass. *Proceedings.*
Botanical Gazette, Chicago, Ill.
† Botanical Magazine, London, England.
Botanical Society of America: see America, Botanical Society.
† Botanische Jahrbücher, Leipzig, Germany.
† Botanische Zeitung, Leipzig, Germany.
† Botanischer Jahresbericht, Leipzig, Germany.
† Botanisches Centralblatt, Cassel, Germany.
† Botanisches Centralblatt, Beihefte, Cassel, Germany.
‡ Botanisk Tidsskrift: see Copenhagen, Société Botanique.
Botaniste: see Le Botaniste.
‡ Botaniska Notiser, Lund, Sweden.
Brandenburg. Botanischer Verein der Provinz Brandenburg, Berlin, Germany. *Verhandlungen.*
Braunschweig. Herzoglicher Botanischer Garten, Brunswick, Germany. *Seed Lists.*
Bremen. Naturwissenschaftlicher Verein, Bremen, Germany. *Abhandlungen.*
* British Mycological Society, Worcester, England. *Transactions.*
Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y. *Report*, *Memoirs of Natural Science*, *Science Bulletin*, *Museum News*, *Cold Spring Harbor Monographs.*
Broteria: Revista de Sciencias Naturaes do Collegio de S. Fiel, Lisbon, Portugal.
Brussels. Institut Botanique de l'Université, Brussels, Belgium, *Recueil.*
Brussels. Jardin Botanique de l'État, Brussels, Belgium. *Bulletin.*
* Bryologist, Brooklyn, N. Y.
Bucharest. Institut Botanique, Bucharest, Roumania, *Bulletin de l'Herbier.*

Budapest. Hortus Botanicus Universitatis Budapestinensis, Budapest, Hungary. *Seed Lists.*

Buenos Aires. Jardin Botanico Municipal de Buenos Aires, Buenos Aires, Argentine Republic. *Seed Lists.*

Buenos Aires. Museo de Farmacologia, Buenos Aires, Argentine Republic. *Trabajos.*

Buenos Aires. Museo Nacional, Buenos Aires, Argentine Republic. *Anales.*

Buffalo Botanic Garden, West Seneca, N. Y.

Buffalo Park Commissioners, Buffalo, N. Y. *Annual Report.*

Buffalo Society of Natural Sciences, Buffalo, N. Y. *Bulletin.*

* Buitenzorg. Jardin Botanique, Buitenzorg, Java. *Annales.*

Buitenzorg. Jardin Botanique, Buitenzorg, Java. *Bulletin*, *Mededeelingen*, *Verslag*, *Icones Bogorienses.*

* Bulletin du Jardin Colonial et des Jardins d'Essai des Colonies Françaises, Paris, France.

Bulletin of Pharmacy, Detroit, Mich.

Calcutta. Indian Museum, Calcutta, India. *Indian Museum Notes.*

‡ Calcutta. Royal Botanical Gardens, Calcutta, India. *Annals.*

California Academy of Sciences, San Francisco, Calif. *Proceedings.*

California State Agricultural Society, Sacramento, Calif. *Transactions.*

California State Board of Horticulture, Sacramento, Calif. *Report.*

California. University of California, Berkeley, Calif. *Contributions from the Botanical Seminary*, *Contributions from the Botanical Laboratory*, *Seed Lists*, *Publications in Botany.*

Canada. Botanical Club of Canada, Halifax, Canada. *Annual Report.*

Canada. Geological and Natural History Survey, Ottawa, Canada. *Contributions from the Herbarium.*

Canada. Report of the Minister of Agriculture, Ottawa, Canada.

‡ Canadian Record of Science, Montreal, Canada.

Carnegie Institution, Washington, D. C. *Yearbook*, *Publications.*

Carnegie Institution of Washington: Desert Botanical Laboratory, Tucson, Arizona.

Carnegie Institution of Washington: Station for Experimental Evolution, Cold Spring Harbor, N. Y. *Papers*, *Report*.

Carnegie Museum, Pittsburg, Pa. *Annals*, *Annual Reports*, *Memoirs*.

Catania. Hortus Botanicus Regiae Universitatis Catinensis, Catania, Italy. *Seed Lists*.

Cellule: see La Cellule.

* Centralblatt für Bakteriologie: Abtheilung I, Jena, Germany.

* Centralblatt für Bakteriologie: Abtheilung II, Jena, Germany.

Charleston. College of Charleston Museum, Charleston, S. C. *Bulletin*.

Chicago. University of Chicago, Chicago, Ill. *Contributions from the Hull Botanical Laboratory*.

Chile. Museo Nacional, Santiago de Chile, Chile. *Anales*.

Christiania. Hortus Botanicus, Christiania, Norway. *Seed Lists*.

Christiania. Physiographiske Forening, Christiania, Norway. *Nyt Magazin for Naturvidenskaberne*.

Christiania. Videnskabs-Selskabet, Christiania, Norway. *Skrifter*.

Cincinnati. Botanical Gardens, Cincinnati, Ohio.

Cincinnati Society of Natural History, Cincinnati, Ohio. *Journal*.

Clara Leigh Dwight Gardens, Mount Holyoke College, Mass. *Seed Lists*.

Cold Spring Harbor Monographs: see Brooklyn Institute of Arts and Sciences.

Cologne. Botanischer Garten der Stadt Cöln, Cologne, Germany. *Seed Lists*.

Colombia. Ministerio de Obras Publicas y Fomento, Bogota, Colombia. *Revista*.

Colorado College Studies, Colorado Springs, Colo.

Colorado State Board of Agriculture, Denver, Colo. *Annual Report*.

Colorado. University of Colorado, Boulder, Colo. *Studies*.

Columbia University, New York, N. Y. *Contributions from the Department of Botany*, *Memoirs of the Department of Botany*, *Contributions from the Department of Geology*.

† Columbus Horticultural Society, Columbus, Ohio. *Journal*.

Connecticut Academy of Arts and Sciences, New Haven, Conn. *Transactions*.

Connecticut. Geological and Natural History Survey, Hartford, Conn. *Bulletin.*

Connecticut State Board of Agriculture, Hartford, Conn. *Annual Report.*

Conservation, Washington, D. C.

Copenhagen. Botanic Garden, Copenhagen, Denmark. *Arbejder.*

‡ Copenhagen. Société Botanique, Copenhagen, Denmark. *Botanisk Tidsskrift.*

Costa Rica. Sociedad Nacional de Agricultura, San José de Costa Rica. *Boletin.*

Country Life in America, New York, N. Y.

Cracow. Académie des Sciences de Cracovie, Cracow, Austria. *Bulletin International*, *Catalogue of Polish Scientific Literature.*

Cuba. Estación Central Agronómica, Santiago de las Vegas, Cuba, W. I. *Bulletin*, *Circular.*

Cuba Review, New York, N. Y.

Curtis' Botanical Magazine: see Botanical Magazine.

Davenport Academy of Sciences, Davenport, Ia. *Proceedings.*

Delaware County Institute of Science, Media, Pa. *Proceedings.*

Denison University, Granville, O. *Bulletin of the Scientific Laboratories.*

Desert Botanical Laboratory: see Carnegie Institution, Desert Botanical Laboratory.

Detroit. Commissioner of Parks and Boulevards, Detroit, Mich. *Annual Report.*

‡ Deutsche Botanische Gesellschaft, Berlin, Germany. *Berichte.*

Deutsche Dendrologische Gesellschaft, Poppelsdorf bei Bonn, Germany. *Mitteilungen.*

Dorpat: see Jurjeff.

Dublany. Hortus Botanicus Academicus: see Lemberg, Hortus Botanicus.

Dublin. Royal Botanic Gardens, Glasnevin, Dublin, Ireland. *Seed Lists.*

‡ Edinburgh Botanical Society, Edinburgh, Scotland. *Transactions.*

Edinburgh. Royal Botanic Garden, Edinburgh, Scotland. *Seed Lists.*

Eli Lily and Company, Indianapolis, Ind.

Elisha Mitchell Scientific Society, Chapel Hill, N. C. *Journal.*

Eritrea: see Asmara.

Fauna: see Luxemburg, Société des Naturalistes Luxembourgeois.

* Fern Bulletin, Joliet, Ill.

Feuille des Jeunes Naturalistes, Paris, France.

Field Museum of Natural History, Chicago, Ill. *Publications: Botanical Series*, *Report Series.*

† Flora, Marburg, Germany.

Florence. R. Orto Botanico, Florence, Italy. *Lavoria.*

Florida. Report of the Commissioner of Agriculture, Jacksonville, Florida.

Florida State Horticultural Society, Jacksonville, Fla. *Proceedings.*

Florists' Exchange, New York, N. Y.

Flower Preservation Society of America, Washington, D. C. *Circulars.*

Forest and Stream, New York, N. Y.

Forestry Quarterly, Toronto, Ont.

† France. Société Botanique de France, Paris, France. *Bulletin.*

France. Société Dendrologique de France, Paris, France. *Bulletin.*

† France. Société Mycologique de France, Paris, France. *Bulletin.*

Frankfort on Main. Senckenbergische Naturforschende Gesellschaft, Frankfurt a/M., Germany. *Berichte.*

‡ Frankfort on Oder. Naturwissenschaftlicher Verein des Regierungsbezirkes, Frankfurt a/O., Germany. *Helios.*

† Garden, London, England.

‡ Garden Magazine, New York, N. Y.

† Gardener's Chronicle, London, England.

‡ Gardener's Chronicle of America, Jersey City, N. J.

Gardening, Chicago, Ill.

* Gartenflora, Munich, Bavaria, Germany.

* Gartenkunst, Berlin, Germany.

Geneva. Jardin d'Acclimatation Alpin, Genève, Switzerland. *Seed Lists.*

Geneva. Jardin Botanique de Genève, Genève, Switzerland. *Bulletin du Laboratoire Général*, *Annuaire.*

Geneva. Université de Genève, Laboratoire de Botanique, Genève, Switzerland. *Etudes.*

Georgia State Horticultural Society, Augusta, Ga. *Proceedings.*

Gera. Gesellschaft von Freunden der Naturwissenschaften in Gera, Gera, Germany. *Jahresbericht.*

Gray Herbarium: see Harvard University.

Grenoble. Jardin des Plantes de la Ville de Grenoble, Grenoble, France. *Seed Lists.*

Grenoble. Université de Grenoble, Jardins Botaniques Alpins, Grenoble, France. *Seed Lists.*

Groningen. Jardin Botanique de l'Université, Groningen, Holland. *Seed Lists.*

Gulf Biologic Station, Cameron, La. *Bulletin.*

Hamburg. Naturwissenschaftlicher Verein, Hamburg, Germany. *Verhandlungen*, *Botanical papers from the Abhandlungen.*

Hamburgische Botanische Staatsinstitute, Hamburg, Germany. *Seed Lists.*

Hamilton Scientific Association, Hamilton, Ontario. *Journal and Proceedings.*

Hardwood Record, Chicago, Ill.

Harlem. Kolonial Museum te Haarlem, Haarlem, Holland. *Bulletin.*

Hartley Botanical Laboratories: University of Liverpool, Liverpool, England. *Publications and Reprints.*

Harvard University, Cambridge, Mass. *Contributions from the Gray Herbarium*, *Contributions from the Cryptogamic Laboratory*, *Contributions from the Phanerogamic Laboratory.*

Havana. Jardin Botanico de la Universidad, Havana, Cuba.

Havana. Universidad de la Habana, Havana, Cuba. *Revista de la Facultad de Letras y Ciencias.*

Hawaii. Sugar Planter's Association Experiment Station, Honolulu, Hawaii. *Report*, *Bulletin.*

Hawaiian Forester and Agriculturist, Honolulu, Hawaii.

‡ Hedwigia, Dresden, Germany.

Helios: see Frankfort on Oder, Naturwissenschaftlicher Verein.

Helsingfors: Universitetets Botaniska Institution, Helsingfors, Finland. *Miscellaneous botanical reprints and papers.*

Hérault. Société d'Horticulture et d'Histoire Naturelle de l'Hérault, Montpellier, France. *Annales.*

* Herbier Boissier, Geneva, Switzerland. *Bulletin.*

Holland. Société Botanique Néerlandaise, Nijmegen, Holland. *Nederlandsch Kruidkundig Archief*, *Recueil des Travaux botaniques Néerlandais.*

Hooker's Icones Plantarum: see Icones Plantarum.
Hopkins Seaside Laboratory: see Leland Stanford Jr. University.
Horticulture, Boston, Mass.
Hortus Thenensis: see Tirlemont.
* House and Garden, Philadelphia, Pa.
Household Journal and Floral Life, Springfield, O.
Howard Memorial Library, New Orleans, La.
Hull Botanical Laboratory: see Chicago University.
Hungary. Institut Central Ampélogique Royal Hongrois, Budapest, Hungary. *Annales.*
‡ Icones Plantarum, London, England.
Icones Selectae Horti Thenensis: see Tirlemont.
Illinois Farmer's Institute, Springfield, Ill. *Annual Report.*
Illinois State Department of Agriculture, Springfield, Ill. *Transactions.*
Illinois State Laboratory of Natural History, Urbana, Ill. *Bulletin.*
India. Botanical Survey of India, Calcutta, India. *Records.*
India. Department of Agriculture in India, Pusa, India. *Memoirs.*
India. Imperial Department of Agriculture, Calcutta, India. *Annual Report.*
India Rubber World, New York, N. Y.
Indian Museum Notes: see Calcutta, Indian Museum.
Indiana Academy of Science, Indianapolis, Ind. *Proceedings.*
Indiana Horticultural Society, Indianapolis, Ind. *Transactions.*
* International Catalogue of Scientific Literature: Botany, London, England.
International Society of Arboriculture, Connersville, Ind. *Arboriculture.*
Iowa Academy of Sciences, Des Moines, Ia. *Proceedings.*
Iowa Department of Agriculture, Des Moines, Ia. *Yearbook.*
Iowa Naturalist, Iowa City, Ia.
Iowa Park and Forestry Association, Iowa City, Ia. *Proceedings.*
Iowa State College of Agriculture and Mechanic Arts, Ames, Ia. *Contributions from the Botanical Department.*
Iowa State Horticultural Society, Des Moines, Ia. *Transactions.*
Iowa State University, Iowa City, Ia. *Bulletin of the Natural History Laboratories.*
‡ Italy. Società Botanica Italiana, Florence, Italy. *Bullettino, Nuovo Giornale Botanico Italiano, Bullettino Bibliografico.*

† Jahrbücher für Wissenschaftliche Botanik, Leipzig, Germany.

* Jahresbericht der Vereinigung der Vertreter der Angewandten Botanik, Berlin, Germany.

* Jahresbericht über das Gebiet der Pflanzenkrankheiten, Berlin, Germany.

† Jahresbericht über die Fortschritte in der Lehre von den Pathogenen Mikroorganismen, Leipzig, Germany.

Jamaica. Public Gardens and Plantations, Kingston, Jamaica. *Bulletin of the Department of Agriculture.*

Japan. Imperial Central Agricultural Experiment Station, Tokio, Japan. *Bulletin.*

Jardin Colonial: see Bulletin du Jardin Colonial et des Jardins d'Essai des Colonies Françaises.

Java. Proefstation voor Suikerriet in West Java, Dutch East Indies. *Mededeelingen.*

"Jevremovac": see Belgrade, Jardin Botanique "Jevremovac."

Johns Hopkins University, Baltimore, Md. *Circulars.*

* Journal d'Agriculture Tropicale, Paris, France.

† Journal de Botanique, Paris, France.

* Journal des Roses, Melun, France.

* Journal of Biological Chemistry, New York, N. Y.

‡ Journal of Botany, British and Foreign, London, England.

Journal of Geography, Columbia University, New York, N. Y.

* Journal of Mycology, Columbus, Ohio.

Journal of Pharmacology, New York, N. Y.

Jurjeff. University, Jurjeff (Dorpat), Russia. *Acta Horti Botanici Jurjevensis.*

Kansas Academy of Sciences, Topeka, Kans. *Transactions.*

Kansas University Science Bulletin, Lawrence, Kans.

Karlsruhe. Botanischer Garten der Technischen Hochschule, Karlsruhe, Germany. *Seed Lists.*

Kew. Royal Gardens, Kew, England. *Bulletin of Miscellaneous Information.*

Kharkow. Société des Naturalistes de l'Université Impériale à Kharkow, Kharkow, Russia. *Travaux.*

* La Cellule, Lierre, France.

L'Agricoltura Coloniale: see Asmara.

Landshut. Botanischer Verein, Landshut, Bavaria, Germany. *Berichte.*

La Plata. Museo de la Plata, La Plata, Argentina. *Revista.*

* Leaflets of Botanical Observation and Criticism, Washington, D. C.

* Leaflets of Philippine Botany, Manila, P. I.

Le Bambou, Mons, Belgium.

* Le Botaniste, Poitiers, France.

Leland Stanford Jr. University: Hopkins Seaside Laboratory, San Francisco, Calif. *Contributions.*

Lemberg. Hortus Botanicus Academicus Dublanensis, Lemberg, Austria. *Seed Lists.*

Leyden. Ryks Herbarium, Leyden, Holland. *Annales du Musée.*

Leyden. University Botanic Garden, Leyden, Holland. *Seed Lists.*

Liège. Institut Botanique de l'Université, Liège, Belgium. *Archives.*

Lima. Sociedad Geografica de Lima, Lima, Peru. *Boletin.*

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REPORT OF THE HEAD GARDENER

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1908.

Systematic Plantations

Herbaceous Grounds. The collection of herbaceous plants, including those at the nurseries, contains about 2,410 species. There have been added to the show labels already in position 932 wooden labels and 32 lead ones, making a total of 964.

Fruticetum. This collection now contains about 1,480 shrubs, illustrating, with some few still at the nurseries, about 700 species and varieties. There have been added during the year 808 show labels, about 400 of these being required to replace those stolen in the early part of the year.

Salicetum. The collection of willows and poplars in the north meadows remains about the same, with 125 specimens, including 45 species and varieties.

Deciduous Arboretum. Including those still at the nurseries and native to the tract, this collection contains about 257 species and varieties. A lead label has been designed for use here on trees too small to take the ordinary tree label. It is made after the manner of the regular tree label, but is smaller, and is attached to a branch of the tree by a large loop. Of these 60 have been made and placed in position. The arboretum now contains in place 395 specimens.

Pinetum. In the collection of conifers, including those still at the nurseries, there are 270 species and varieties; there are 875 specimens in the pinetum. There have been added during the year 4 show labels.

Viticetum. To the vines represented here last year 6 have been added, making a total of 40. For this collection 23 lead labels have been made.

Conservatories. The collections here embrace 10,090 plants, an increase of 871 since the previous year. In the following table is indicated the number of plants in each house:

House no.	1	370	House no.	9	92
"	2	564	"	10	498
"	3	449	"	11	328
"	4	431	"	12	818
"	5	1,490	"	13	496
"	6	1,039	"	14	599
"	7	776	"	15	1,233
"	8	907			

In the collections here and those at the propagating houses there are represented about 205 families, 1,400 genera and 8,000 species and varieties, with a total number of specimens in both places of about 19,088.

There have been made for these collections during the year, 2,204 zinc and 164 lead labels, making a total of 2,368.

PROPAGATING HOUSES AND NURSERIES. The study collections of the cactus and stonecrop families occupy the great part of houses nos. 5 and 6; a large part of house no. 4 has been at the disposal of the Director of the Laboratories, as has also a part of the nurseries.

From outside sources there have been received 211 packets of seeds; of these 46 were obtained by gift, 75 by exchange, and 90 were collected by members of the staff. There have been collected in the various plantations 221 packets of seeds. The propagating houses, including the cold frames, contain 8,998 specimens.

LABELING, RECORDING AND HERBARIUM. The details of this work have been under the direction of Mr. Norman Taylor, who has had to assist him one garden aid and one gardener.

In addition to 600 lead show labels repaired, the following new show labels, of various kinds, have been made:

Arboretum	60
Herbaceous Grounds	996
Morphological Garden	60
Economic Garden	100

Conservatories	2,368
Pinetum.	4
Fruticetum	808
Viticetum	23
Trees along roads and paths	85
Conservatory pools	67
Conservatory decorative beds	141
	4,712

Accession numbers 29,090–29,937 have been recorded during the year, making a total of 848 accessions. The total number of plants derived from all sources has been 2,358, of which 410 were by gift, 233 from exchanges, 482 derived from seeds, 134 from our own collections, and 1,114 by purchase.

To the herbarium of cultivated plants have been added 963 specimens, 238 from the conservatory collections and 725 from those outside.

In the following table will be found the approximate number of species and varieties in each collection.

Conservatories	8,000
Herbaceous Grounds	2,410
Fruticetum	700
Deciduous Arboretum	257
Pinetum	270
Salicetum	45
Viticetum	40
	11,722

Miscellaneous Collections

MORPHOLOGICAL GARDEN. This collection has been maintained during the year as it was in 1907. There have been added 48 wood and 6 lead show labels, making a total of 54.

ECONOMIC GARDEN. The amount of ground here under cultivation was considerably increased last year, experience demonstrating that some of the more vigorous plants needed more space for their proper exhibition and also to prevent their encroaching upon the space allotted to less robust neighbors. This extended space added much to the appearance of the exhibit. No new beds were added. A total of 100 show labels has been added, comprising 87 wood and 13 lead.

American Desert Plants. The same space in the court of the conservatories was devoted to this collection as in the previous year. The plants are set out the latter part of May and returned to the houses during the first week in September. There were used in this display about 550 plants, representing 7 families.

Conservatory Lily Pools. The plants here proved a feature of great interest. The tender sorts in the west pool and the hardy ones in the easterly one have not been surpassed in previous years in the luxuriance of growth and abundance of flowers. It was decided not to attempt to heat the pool for the tender kinds, where the *Victoria* had previously been grown, after heat was no longer needed for the conservatories, so it was not possible to grow successfully the largest of all water lilies, the *Victoria*. To those already in position here 67 lead show labels were added.

Conservatory Flower Garden. The decorative beds installed in the grass plots to the north of the conservatories have been maintained. The perennials have now secured a firm foothold and made an excellent show during the past summer. Show labels to the number of 141 were added. During the past fall about 6,000 bulbs were planted here, including tulips, narcissus, chionodoxas, snow-drops and hyacinths.

General Horticultural Operations

For the prosecution of this the available force consisted of the following: 2 foreman-gardeners, 17 gardeners, 4 apprentices and 14 laborers. In addition to these there were 3 drivers for mowing and hauling, one for the entire time, the others for the mowing season.

This force was detailed as follows: 1 foreman-gardener, 10 gardeners and 2 apprentices to the conservatories, including the care of the decorative planting in the immediate vicinity and of the flower beds and urns at the fountain at the foot of the museum approach; 1 foreman-gardener, 1 gardener and 2 apprentices to the propagating houses for the early part of the year, and later, 2 gardeners and 2 apprentices, 1 of the latter being withdrawn in July; 1 foreman-gardener, 4 gardeners and the laborers to the work outside.

The change in the force at the propagating houses was due to the resignation in March of the foreman-gardener at the conservatories. This necessitated a readjustment, and the foreman-gardener, Richard Richter, in charge of the propagating houses was promoted by transferral to the conservatories, being given oversight of the work at both places, a gardener from the conservatories taking charge of the details of the work at the propagating houses under his direction.

The force for the outside work was divided as follows: museum tract, 2 laborers; conservatory tract, 1 gardener and 1 or 2 laborers; west border tract, 1 gardener and 1 laborer; fruticetum tract, 1 gardener, 2 laborers and 1 apprentice; herbaceous grounds tract, 1 gardener and 4 laborers; for miscellaneous operations, including the care of the arboretum, scythe work and the cleaning of walks, 4 laborers. Upon the completion of gardening operations in the fall, 2 of the gardeners were transferred to the consevatories.

A large amount of new park planting was completed during the year. During January, trees of the swamp oak and of the sweet gum were transplanted from the vicinity to the borders of the road connecting the fruticetum with the northern entrance to the grounds. During the spring the following planting was done: the beds devoted to the honeysuckle and rose families, on opposite sides of the path from the museum to the Harlem depot, were rearranged and thinned out, about one half the material being removed and used elsewhere; the rose bed near the Harlem depot was abandoned, as the surroundings required more conspicuous treatment, the rose bushes being distributed in the west border and other decorative collections, their place being taken by a miscellaneous collection of shrubs of the hydrangea family, obtained from elsewhere on the grounds; the forsythia and lilac bed on the south side of the depot plaza was rearranged, the surplus, about one third of the plants, being used elsewhere; the planting of the north bank, at the exit of the Southern Boulevard to Bedford Park, was improved by the addition of a number of plants of aralia, supplementing those already there; bitter-sweet vines were planted on the rock at the south entrance; to avoid an element of danger, as they obscured the view of drivers of vehicles, all the larger shrubs in the beds opposite to the spruce collection, between the walk and the road, were removed and transferred to the old rose bed, already referred to — the place made vacant was filled with lower-growing shrubs; the corners between the road and the paths, opposite the planting at the south gate, were planted with Japanese barberries, obtained elsewhere in the grounds; the planting of the south border, between the path and the road, was completed — the extension running from the knoll to the culvert at the conifer collection — the shrubs necessary being derived from an overhauling of other parts of the border to the west, from the beds devoted to the honeysuckle and rose families, already referred to, and from the nursery, the latter including a number of American thorns; a corner in the fruticetum, opposite the rose collection, was planted with the large rose bushes from the old rose bed; ornamental plantings of boxes, sumacs and Japanese maples were installed on the banks of the fruticetum opposite the collections containing such plants; boxes were planted on the south side of the fountain enclosure at the foot of the museum approach; the small central grass plot to the north of the conservatories was replanted with a collection of conifers, obtained from Mr. Lowell M. Palmer, the previous planting at that place not being satisfactory; 12 American elms were placed along both sides of the south road between the knoll and the south gate; the point to the south of the taxodium collection, separating the path from the road, was planted with a miscellaneous collection of roses; the natural growth on the border of the woodland at the southeast corner of the morphological garden was supplemented with other wild shrubs obtained on the grounds.

During the fall the following work was finished: the low land to the south of the culvert in the conifer collection was planted with willows and poplars from the old nursery; the triangle in the herbaceous grounds, in the neighborhood of the sedge collection, was filled in with wild shrubs obtained in the grounds; the bank and strip between the path and road, on the east end of the long bridge, was planted with Japanese barberries and viburnums; that portion of the west border, south of the Mosholu bridge, formerly devoted to a collection of dahlias, was permanently planted with shrubs; the beds of shrubs on both sides of the path leading from the elevated approach to the conservatories were replanted, about one half of the material being removed; the completion of the fence along the south boundary made the planting of shrubs there desirable, and the strip of ground between the path and the fence was devoted to a miscellaneous collection of shrubs derived from a thinning out of the border on the opposite side of the path, from the beds near the elevated approach, already referred to, from our own nurseries, and from the woods. The usual horticultural operations were prosecuted during the year: the pruning of trees, including a thorough inspection of those constituting the arboretum collection; top-dressing lawns and around such shrubs and trees as required it; the protection of half tender plants from the cold; the raking and gathering of fallen leaves which were preserved in piles to make leaf-mold, so necessary in greenhouse operations and for the top-dressing around conifers; the turning over of manure and leaf-mold piles; and much other work of this nature.

Investigations

Mr. Norman Taylor, custodian of the plantations, in addition to his work on the cultivated plants, has continued his studies on the genus *Potamogeton*, and has submitted for publication in "North American Flora" the manuscript embodying the results of his studies on these plants and upon the other families in the Naiadales.

In addition to my executive duties and my work upon the cultivated plants, especially among the orchids and bromeliads, I have completed and submitted for publication the following manuscripts: The Grasses of Jamaica, treated much after the same manner as your work on the sedges of the same island; the tribes Maydeae and Androgoneae of the grass family, for publication in "North American Flora."

Respectfully submitted,
George V. Nash,
Head Gardener.

REPORT OF THE SUPERINTENDENT OF GROUNDS

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit the following report for the year 1908.

Construction of Driveways

The driveway approach to the main entrance of the new conservatories east of the Bronx River, 700 feet in length and 40 feet in width, was completely paved, covered with trap rock, screened, rolled and opened for use in December.

Construction of the driveway from the plaza near the Bleecker Street entrance of the Garden, 1,800 feet long and 40 feet wide, which was begun in 1907, was resumed in October, 2,500 feet of top soil being first removed and carted to the area north of the museum building and other parts of the grounds. This road was about two thirds graded and the line stones laid, and about one fifth of it was covered with Telford and trap rock. This work is still in progress.

Paths

Much progress in the construction of paths has been made on the east side of the river between the main road and the new conservatories. All the paths begun at this point the previous year and additional lines laid out in the spring were completed and thrown open to the public during 1908. They are all 11 feet wide and have a total length of 1,500 feet.

Two paths left in an unfinished condition in 1907, one north of the large lake and another north of the economic garden leading to the arbor and branching into the edge of the hemlock forest, measuring 700 feet in total length, were completed and opened during the year. Additional paths have been laid out near the river, one leading from the dam between the lakes beneath the westerly arch of the long bridge in a northerly direction and one east of the river on the hillside. These have been graded and the line stones laid for a distance of about 500 feet.

About 500 feet of path parallel with the main driveway south of Newell Avenue bridge in the north meadows was paved or filled in with soft rock.

The existing paths and sides of the driveways have been widened and grass gutters regulated where it was found necessary.

Drainage

A new 6-inch drain was laid from the comfort station east of the elevated approach to the main sewer north of the approach, a distance of 210 feet.

Before grading could be begun southwest of the new conservatories, eight catch-basins had to be constructed and 360 feet of 6-inch sewer pipe laid; two catch-basins were required at the junction of the new roads near the Bleecker Street entrance.

An 8-inch drain was laid under the floor line of the cellar of the new greenhouses and continued for a distance of 550 feet. The springy condition of the earth under the floor of the cellar of the new houses made it necessary to lay 182 feet of 4-inch tile which was connected with the main drain.

All the catch-basins previously constructed were inspected and cleaned when necessary.

There has been laid 610 feet of 8-inch drain pipe, 550 feet of 6-inch, and 182 feet of 3-inch during the year. The whole drainage system seems to work to perfection.

Regulating and Grading

Early in January the excavation of the cellar for the continuation of the new conservatories was begun, this cut being 315 feet long, 20 feet wide and 14 feet deep. The 2,338 cubic yards of soil and stone removed were used in filling and grading about the lakes and along the river. Several low, swampy grounds and the slopes north of the middle lake and near the long bridge were filled and brought to finished grade with top soil obtained from the new paths under construction.

After the additional paths were laid out and the sub-drainage completed on the area southwest of the new greenhouses, the grounds were graded and finished with top soil, and the paths edged with sod and sown with grass seed over an area of about 1,400 square feet. The slope on the side north of the road leading from the long bridge east to the plaza near the stable, about 150 feet, was completely graded and sodded.

An area about 75 by 100 feet, north of the middle lake, was filled, regulated and sown.

After the completion by contract of the southern boundary wall and fence extending from the elevated railway station to the Southern Boulevard, the entire border between the path and the fence, 2,000 feet in length, with an average width of about 15 feet, was graded and sown or planted with shrubs.

About one half acre of land north of the museum building has been graded with top soil obtained from the new road in process of construction east of the Bronx River and sown. Regulating and grading is now in progress about the new conservatories and power house.

Work Performed by Mechanics

Carpenters. In January and February, 32 linear feet of standard herbarium cases were constructed by our carpenters for the museum. Twenty new rustic benches were built for the grounds, and all the older ones put in good repair. The doors at the entrances of the museum building have been repaired. The rustic cedar fence along the southern boundary line east of the herbaceous grounds has been extended 425 feet to a path parallel with the driveway through the forest. In September, 300 blocks for mounting specimens were made for the museum, and in October, 3,000 feet of weather strips were put on the windows on the top floor of the museum building. A new set of doors, 8 × 14 feet, were made for the power house, in addition to various indoor repairs.

A number of small jobs and minor repairs had to be looked after during the year, such as reconstructing the entrances to the stable and repairing the stable fence, repairing the sash, doors and locks in the propagating houses and conservatories, and mending the wagons, carts and tools.

Painters. The walls and ceiling on the landing from the first floor of the museum building and on the second floor of the east wing were painted with three coats and stippled. All the exterior wood and metal work of the building received one coat. All the entrances and doors were scraped and painted with four coats of varnish, and all the iron work and skylights on the roof received two coats.

The entire conservatory range below the gutter line was painted with one coat, and the gutters were cleaned and painted. Considerable glazing and other repairing was necessary during the year. The roofs of all the propagating houses were shaded in early spring, and also the exterior of all the houses except 5 and 6.

All the uprights and gutters of the stable and the picket fence around the yard were painted with one coat.

The exterior wood and metal work of the comfort station for men was painted with one coat, and the hardwood trimming on the interior was varnished.

The exterior wood work of the power house was painted with one coat and the skylights and other iron work received two coats. All the wood work on the interior received one coat.

In addition to the above, the painters have at various times engaged in emergency work in all the buildings, replacing broken glass, renovating garden signs, painting iron fences, carts and other machinery.

Stone Masons. The construction of a wall and iron fence along the southern property line made it necessary to remove and relocate the steam heating connection and the sewer of the men's comfort station. A trench was made 210 feet in length and 18 by 14 inches in cross-section, with concrete bottom, brick sides and covering of blue-stone flags, in which the steam pipes were placed, and a 6-inch sewer was laid outside the brick work of this trench and connected with the main drain. A portion of the roof of the museum building was put in repair, 1,644 square feet of tile being taken up, and relaid in cement and concrete where it was found necessary. The gutters and leaders were put in good condition.

The steps in front of the building and most of the area walls in front and at the sides have been pointed up and some of the terra cotta work reset and filled.

The joints of the 4-foot exterior limestone wall of the conservatories, constructed of blocks 18 by 18 inches, have been repaired and pointed for a distance of 1,380 feet.

On the roof of the power house, 450 square feet of tiling has been relaid in cement, the top walls being pointed and reconstructed where necessary.

Eleven catch-basins and dry-wells were constructed during the year, all fitted with iron covers.

Plumbers. The 4-inch water-main laid up to the northern corner of the new conservatories in 1907 was extended 80 feet to the subway, and connected to a 3-inch galvanized pipe 180 feet in length extending to the power house.

Repairs were necessary at the comfort stations, but all work of that kind since July 15 was done by employees.

Blacksmith. All the drills used in the quarry were sharpened and the carts, one wagon, a sleigh, some agricultural machinery and various small tools were put in good repair.

Stable, Horses and Equipments

The stable has been kept in a sanitary condition and good repair. Of the eight horses, seven are in excellent condition. The expenditures for feed amounted to $854.12, and for horse-shoeing, $185.50.

An inventory and inspection in December showed the agricultural machinery to be in good condition and sufficient number for the present, with the exception of two side-bar lawn-mowers which cannot be repaired to advantage.

Miscellaneous

It gives me pleasure to report that with an increase of visitors during the summer fewer violations of Garden restrictions were recorded, only four arrests having been made by our special guards. In each case the court imposed a fine of from one to five dollars. The greatest injury now done by the public is in the hemlock forest, where new trails are being made in all directions.

The upper and middle lakes have been cleaned of pond weed several times, and all the lakes and swampy grounds were treated with copper sulphate or kerosene monthly during the summer.

A great number of rounded boulders found in old stone fences and excavations have been used to build a low protection-wall along the steep bank of the Bronx River, where the driveway approaches near the bank.

Respectfully submitted,
F. A. SCHILLING,
Superintendent of Grounds.

SCHEDULE OF EXPENDITURES DURING 1908, UNDER APPROPRIATIONS

1. City Maintenance Account			$75,000.00
Salaries and Wages			
Appropriated		63,800.00	
Expended.			
Salaries	62,495.35		
Labor	1,262.69	63,758.04	
Balance		41.96	
Repairs and Renewals. (Buildings)			
Appropriated		1,000.00	
Expended		997.32	
Balance		2.68	
Supplies			
Appropriated		10,000.00	
Expended through Park Department contracts for coal	9,962.53		
Expended by N. Y. Botanical Garden	37.47	10,000.00	
Incidental Expenses			
Appropriated		100.00	
Expended		100.00	
Telephone — Rental of			
Appropriated		100.00	
Expended		89.13	
Balance		10.87	
Total expended			74,944.49
Balance			55.51

2. Construction and Equipment

January 1, Balance of Appropriation brought forward	90,911.41	
August 4, New Appropriation	25,000.00	
Premium on Bonds	2,492.56	118,403.97

Expended through Park Department, miscellaneous contracts and expenditures.....		96,334.71	
Expended by N. Y. Botanical Garden.			
Salaries and labor................	7,552.34		
Sundry expenses....................	1,675.34	9,227.68	
Total expended......................			105,562.39
Available balance..............			12,841.58

3. Garden Accounts

Assistance for Treasurer

Appropriated....................................	180.00
Expended..	180.00

Circulars for Membership

Appropriated....................................		200.00
Expended..	154.64	
Transferred to Photography....................	45.00	199.64
Balance..............................		.36

Contingent Fund

Appropriated....................................		1,500.00
Expended..	760.36	
Transferred to Investigations at other Institutions..............	100.00	
Transferred to Library	185.00	
Transferred to Museums and Herbarium.....	310.00	
Transferred to Publications.....	100.00	
Transferred to Lectures..........................	20.00	1,475.36
Balance..............................		24.64

Contribution to Maintenance

Appropriated....................................		15,000.00
Expended — Labor	9,345.82	
Expended — Supplies	5,637.28	14,983.10
Balance		16.90

Editorial Assistance

Appropriated......................	480.00
Expended..	480.00

Expenses of Consulting Chemist

Appropriated		300.00
Expended		300.00

Exploration and Collecting

Appropriated	800.00	
Refund — overcharge on C. O. D.	5.11	805.11
Expended		765.79
Balance		39.32

Horticultural Prizes

Appropriated		200.00
Expended	162.00	
Transferred to Photography	38.00	200.00

Income of Lydig Fund. (Publications)

Appropriated	2,000.00	
Subscriptions to North American Flora	1,066.60	3,066.60
Expended		2,942.45
Balance		124.15

Income of Stokes Fund. (Preservation of Native Plants)

Appropriated		50.00
Balance		50.00

Income of Students Research Fund

Appropriated		50 00
Balance		50.00

Insurance

Appropriated	400.00	
Transferred from Laboratories.	20.00	420.00
Expended		418.26
Balance		1.74

Investigations at other Institutions

Appropriated	100.00	
Transferred from Contingent Fund	100.00	200.00
Expended		168.15
Balance		31.85

Laboratories

Appropriated		700.00
Expended	387.86	
Transferred to Lectures and Lantern Slides	120.00	
Transferred to Insurance	20.00	
Transferred to Publication	150.00	
Transferred to Purchase of Plants	10.00	687.86
Balance		12.14

Lectures and Lantern Slides

Appropriated	500.00	
Transferred from Laboratories	120.00	
Transferred from Contingent Fund	20.00	640.00
Expended		633.28
Balance		6.72

Library

Appropriated	1,000.00	
Transferred from Contingent Fund	185,00	1,185.00
Expended		1,180.42
Balance		4.58

Museums and Herbarium

Appropriated	1,200.00	
Refund — overcharge on expressage	.35	
Transferred from Contingent Fund	310.00	1,510.35
Expended		1,505.17
Balance		5.18

Photography

Appropriated	100.00	
Transferred from Circulars for Membership	45.00	
Transferred from Horticultural Prizes	38.00	183.00
Expended		164.86
Balance		18.14

Publications. (*General Fund*)

Appropriated	1,000.00	
Transferred from Contingent Fund	100.00	
Transferred from Laboratories	150.00	1,250.00
Expended		1,241.57
Balance		8.43

Purchase of Plants

Appropriated	100.00	
Transferred from Laboratories	10.00	110.00
Expended		103.13
Balance		6.87

Research Scholarships

Appropriatcd		300.00
Expended		250.00
Balance		50.00

Secretary

Appropriated		1,500.00
Expended		1,500.00

Total appropriated for Garden Accounts	27,660.00	
Subscriptions (Income of Lydig Fund)	1,066.60	
Refunds	5.46	28,732.06
Total expended for Garden Accounts		28,281.04
Balance		451.02

4. SPECIAL GARDEN ACCOUNTS

Conservatory Fund

Subscribed 1900	2,110.00	
Subscribed 1901	25.00	
Refund — Balance on draft	15.27	
Subscribed 1902	486.55	
Refund — Unexpended Balance	9.70	
Subscribed 1903	200.00	
Sale of duplicate palms	100.00	
Sale of plants	78.00	
Sale of palms 1904	125.00	
Subscribed 1908	260.00	3,409.52
Expended 1900	710.44	
Expended 1901	1,437.42	
Expended 1902	404.41	
Expended 1903	447.66	
Expended 1904	121.21	
Expended 1908	245.65	3,366.79
Balance		42.73

Exploration Fund

Subscribed 1901	2,050.00	
Refund — Balance on draft	87.59	
Subscribed 1902	2,130.00	
Refund — Unexpended Balance	180.56	
Subscribed 1903	1,565.00	
Refunds — Unexpended Balances	275.11	
Subscribed 1904	3,183.45	
Refunds — Unexpended Balances	110.50	
Subscribed 1905	2,575.00	
Sale of duplicate palms	100.00	
Refunds — part of expenses — Exploration to the Bahamas	125.00	
Subscribed 1906	1,050.00	
Subscribed 1907	2,510.00	
Refunds	529.84	
Subscribed 1908	3,930.00	
Refund — Unexpended Balance	14.49	20,416.54
Expended 1901	2,130.95	
Expended 1902	1,258.32	
Expended 1903	2,880.72	
Expended 1904	2,878.28	
Expended 1905	3,003.37	
Expended 1906	1,027.25	
Expended 1907	2,274.84	
Expended 1908	3,912.13	19,365.86
Balance		1,050.68

Museum and Herbarium Fund

Subscribed 1901	1,800.00	
Subscribed 1902	655.00	
Refund (advance charges on specimens account of R. S. Williams)	131.09	
Subscribed 1903	1,405.00	
Sale of specimens	29.50	
Subscribed 1904	100.00	
Subscribed 1906	2,550.00	
Subscribed 1908	1,575.00	8,245.59
Expended 1901	1,546.19	
Expended 1902	1,024.96	

Expended 1903	1,437.63	
Expended 1904	100.00	
Expended 1906	2,224.57	
Expended 1907	250.00	
Expended 1908	1,646.90	8,230.25
Balance		15.34

Special Book Fund

Subscribed 1899	4,950.00	
Subscribed 1901	1,825.00	
Subscribed 1902	2,265.00	
Subscribed 1903	1,315.00	
Special contribution from Mr. Andrew Carnegie	1,997.88	
Sale of books	59.60	
Refunded — Balance on drafts	20.93	
Subscribed 1904	1,540.00	
Sale of duplicate books	15.15	
Subscribed 1905	2,175.00	
Sale of duplicate books	25.50	
Subscribed 1906	310.00	
Subscribed 1907	100.00	
Subscribed 1908	3,130.00	19,729.06
Expended 1899	1,916.65	
Expended 1900	2,395.28	
Expended 1901	2,463.02	
Expended 1902	2,256.25	
Expended 1903	3,397.75	
Expended 1904	1,031.92	
Expended 1905	2,178.99	
Expended 1906	748.29	
Expended 1907	195.28	
Expended 1908	2,760.36	19,343.79
Balance		385.27
Total expended from Funds of the Garden		36.846.08

WALTER S. GROESBECK,
Accountant.

E. & O. E.

NEW YORK, January 11, 1909.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS

To the Board of Managers of the New York Botanical Garden.

Gentlemen: The number of new members who have qualified during the past year is 34. The number of annual members is now 892; life members 161; sustaining members 26; fellowship members 6.

Of these 41 are now in arrears for dues for 1908, 10 are in arrears for 1907 and 1908, 8 are in arrears for 1906, 1907 and 1908, 6 are in arrears for 1905, 1906, 1907 and 1908, and 6 are in arrears for 1904, 1905, 1906, 1907 and 1908.

Dues have been collected to the amount of $9,485 which has been transmitted to the Treasurer as received.

One person has qualified as a life member by the payment of $250. This sum has been transmitted to the Treasurer for credit to the Endowment Fund.

A complete list of all classes of members to date is herewith submitted.

Benefactors

Hon. Addison Brown,
Andrew Carnegie,
Columbia University,
* Hon. Charles P. Daly,
D. O. Mills,
J. Pierpont Morgan,
John D. Rockefeller,
* Cornelius Vanderbilt.

Patrons

Oakes Ames,
* Mrs. Geo. Whitfield Collord,
* James M. Constable,
* Wm. E. Dodge,
Geo. J. Gould,
Miss Helen M. Gould,
Mrs. Esther Herrman,
John S. Kennedy,
* Oswald Ottendorfer,
Lowell M. Palmer,
William Rockefeller,
* Wm. C. Schermerhorn,
Jas. A. Scrymser,
* Samuel Sloan,
Mrs. Antoinette Eno Wood.

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* Deceased.

Fellows for Life

James B. Ford,
John Innes Kane,
Hon. Seth Low,
M. F. Plant,
Francis Lynde Stetson,
Miss Caroline Phelps Stokes,
Miss Olivia E. Phelps Stokes,
Samuel Thorne,
Tiffany & Co.,
H. C. von Post.

Life Members

Edward D. Adams,
Dr. Felix Adler,
A. G. Agnew,
Mrs. James Herrman Aldrich,
Bernard G. Amend,
Constant A. Andrews,
J. Sherlock Andrews,
Dr. S. T. Armstrong,
Mrs. H. D. Auchincloss,
Samuel P. Avery,
Samuel D. Babcock,
Geo. V. N. Baldwin,
Miss Cora F. Barnes,
Dr. John Hendley Barnhart,
Gustav Baumann,
Samuel R. Betts,
Miss Elizabeth Billings,
Miss Mary M. Billings,
Miss Catherine Bliss,
J. O. Bloss,
George Blumenthal,
George C. Boldt,
G. F. Bonner,
Geo. S. Bowdoin,
J. Hull Browning,
Miss Matilda W. Bruce,
Joseph Bushnell,
T. Morris Carnegie,
Frank R. Chambers,
Hugh J. Chisholm,
Hugh J. Chisholm, Jr.,
Geo. C. Clark,
Banyer Clarkson,
Wm. F. Cochran,
William Colgate,
Miss Georgette T. A. Collier,
Mrs. William Combe,
W. E. Connor,
Theodore Cooper,
Zenas Crane,
R. N. Cranford,
Melville C. Day,
Mrs. John Ross Delafield,
Miss Julia L. Delafield,
Maturin L. Delafield, Jr.,
Anthony Dey,
W. B. Dickerman,
James Douglas,
Miss Josephine W. Drexel,
Miss Ethel DuBois,
Miss Katharine DuBois,
Wm. A. DuBois,
Geo. E. Dunscombe,
Thomas Dwyer,
Newbold Edgar,
George Ehret,
David L. Einstein,
Ambrose K. Ely,
Amos F. Eno,
Edward J. Farrell,
Mrs. H. J. Fisher,
Andrew Fletcher,
Chas. R. Flint,
Henry C. Frick,

Mrs. Theodore Kane Gibbs,
James J. Goodwin,
Daniel Guggenheimer,
Bernard G. Gunther,
Franklin L. Gunther,
Frederic R. Halsey,
Chas. J. Harrah,
Dr. Louis Haupt,
R. Somers Hayes,
James J. Higginson,
George B. Hopkins,
Samuel N. Hoyt,
Gen. Thos. H. Hubbard,
Archer M. Huntington,
Frank D. Hurtt,
James H. Hyde,
Mrs. Columbus O'D. Iselin,
Theo. F. Jackson,
Dr. Walter B. James,
Dr. E. G. Janeway,
Miss Annie B. Jennings,
Walter R. T. Jones,
Eugene Kelly, Jr.,
Nathaniel T. Kidder,
William M. Kingsland,
H. R. Kunhardt,
W. B. Kunhardt,
Charles Lanier,
W. V. Lawrence,
Meyer H. Lehman,
Mrs. Geo. Lewis,
Joseph Loth,
David Lydig,
C. W. McAlpin,
Guy R. McLane,
Emerson McMillin,
Wm. H. Macy, Jr.,
Mrs. Wm. H. Macy, Jr.,
Dr. Francis H. Markoe,
Louis Marshall,
Edgar L. Marston,
Bradley Martin,
Dr. Geo. N. Miller,
A. G. Mills,
John G. Moore,
Hon. Levi P. Morton,
Sigmund Neustadt,
A. Lanfear Norrie,
Gordon Norrie,
Geo. M. Olcott,
Mrs. Chas. Tyler Olmstead,
Wm. Church Osborn,
Henry Parish,
Geo. Foster Peabody,
Wm. Hall Penfold,
Geo. W. Perkins,
W. H. Perkins,
Mrs. Henry C. Potter,
James Tolman Pyle,
M. Taylor Pyne,
Geo. W. Quintard,
J. C. Rodgers,
H. H. Rogers,
Jacob Rubino,
Thomas F. Ryan,
Dr. Reginald H. Sayre,
Edward C. Schaefer,
Jacob H. Schiff,
Mortimer L. Schiff,
Grant B. Schley,
Mrs. I. Blair Scribner,
Isaac N. Seligman,
Geo. Sherman,
William D. Sloane,
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New York, January 11, 1909.

To the Board of Managers of the New York Botanical Garden.

Gentlemen: Herewith I submit a statement of my receipts and disbursements during the year 1908, and a balance sheet from my ledger as of December 31, 1908.

Respectfully yours,
C. F. Cox,
Treasurer.

Receipts

Balance as per last Annual Report......		$ 12,731.25
Contributions of the City towards Development and Maintenance.........		81,989.34
Income from Investments:		
5 per cent. on $50,000 Southern Railway Co. First Consolidated Mtge. Bonds...........................	$ 2,500.00	
4½ per cent. on $50,000 Ches. & Ohio R. R. Co. Genl. Mtge. Bonds..................................	2,250.00	
4 per cent. on $50,000 Erie R. R. Co. Prior Lien Bonds..............	2,000.00	
4 per cent. on $59,000 Erie R. R. Co. Penn. Collat. Trust Bonds...	2,360.00	
4 per cent. on $50,000 Reading R. R. Co., Jersey Central Collat. Trust Bonds..........................	2,000.00	
4 per cent. on $24,000 Northern Pacific R. R. Co. St. Paul & Duluth Division Bonds..................	960.00	
4 per cent. on $30,000 Northern Pacific-Gt. Northern, C. B. & Q. Collat. Trust Bonds................	1,200.00	13,270.00
Annual Dues		8,480.00
Interest at 3 per cent. on balances on deposit with J. P. Morgan & Company..		275.75

Proceeds sales of Merchandise..............	42.00
Proceeds sales of Publications..............	319.88
Life Membership Fees......................	250.00
Fellowship Members Fees..................	400.00
Sustaining Members Fees..................	600.00
Tuition Fees credited to Students' Research Fund..........................	115.00
Subscriptions to "North American Flora" credited to Income of David Lydig Fund................................	1,096.60
Contributions to Special Book Fund......	3,090.38
Contributions to Exploration Fund........	5,015.28
Contributions to Conservatory Fund......	250.00
Contributions to Museum and Herbarium Fund	1,575.00
	$129.500.48

Disbursements

Expenses paid through Director-in-Chief account City Appropriations............	81,989.34	
On General account for vouchers paid.................................	26,562.23	
	$108,551.57	
Purchase of Kuntze Herbarium, etc., account Museum and Herbarium Fund	1,151.31	
Books, account Special Book Fund......	1.976.34	
Specimens, etc., account Exploration Fund	2,892.27	
Publications, account Income of David Lydig Fund	2,246.74	
Purchase of Plants, account Conservatory Fund..................................	91.85	116,910.08
Balance, Cash in hands of Treasurer		$ 12,590.40

LEDGER BALANCES, DECEMBER 31, 1908

Credit

Permanent Funds:

Endowment Fund.......................	$271,160.00
Fellowship Fees	11,000.00

Life Membership Fees	19,250.00	
Students' Research Fund	2,794.50	
David Lydig Fund — Bequest of Chas. P. Daly	34,149.86	
Stokes Fund	3,000.00	
Temporary Funds:		
Special Book Fund, for Library	1,129.67	
Conservatory Fund, for Plants	186.53	
Exploration Fund	2,247.38	
Museum and Herbarium Fund, for Specimens	510.93	
Income Students' Research Fund	343.64	
Income Stokes Fund	279.13	$346,051.64

Debit

Investments:		
Net Cost of $50,000 Ches. & Ohio Ry. Co. Genl. Mtge. Bonds	$302,611.68	
$50,000 Southern Ry. Co. 1st Consol. Mtge. Bonds		
$50,000 Erie R. R. Co. Prior Lien Bonds		
$59,000 Erie R. R. Penn. Coll. Trust Bonds		
$50,000 Reading R. R. Co. Jersey Cent. Coll. Trust Bonds		
$24,000 N. Pacific R. R. Co. St. Paul & Duluth Div. Bonds		
$30,000 N. Pacific-Gt. Northern C. B. & Q. Coll. Tr. Bonds		
Director-in-Chief, Working Fund	25,000.00	
General Income Account, Balance borrowed from Permanent Funds	5,140.97	
Income David Lydig Fund, Balance borrowed from Permanent Funds	708.59	
Cash in hands of Treasurer	12,590.40	
	$346,051.64	$346,051.64

No. 66 BROADWAY,
NEW YORK, January 30, 1909.

JAMES A. SCRYMSER, ESQUIRE,
Chairman of the Finance Committee,
New York Botanical Garden,
New York City.

TREASURER'S ACCOUNT FOR 1908.

Sir: This is to certify that I have, by your direction, examined the books and accounts of the Treasurer of the New York Botanical Garden for the year nineteen hundred and eight (1908), together with their proper vouchers and that I find the Balance Sheet and the Treasurer's Statement of Receipts and Disbursements, attached hereto to be correct.

I have also examined the various Investment Securities and find the same to be as reported in the said Balance Sheet.

Respectfully submitted,
(signed) J. L. MERRILL,
Special Auditor.

No. 66 BROADWAY,
NEW YORK, January 30, 1909.

JAMES A. SCRYMSER, ESQUIRE,
Chairman of the Finance Committee,
New York Botanical Garden,
New York City.

DIRECTOR-IN-CHIEF'S ACCOUNT FOR 1908.

Sir: This is to certify that I have, by your direction, examined and audited the financial books and accounts of the Director-in-Chief of the New York Botanical Garden, for the year nineteen hundred and eight (1908) and that I find the same to be correct, and the Cash Balance to be as stated in the Current Cash Book.

This auditing does not include the examination of the vouchers for either City Maintenance or Construction Work, paid for by the City, such vouchers having been found proper and in order by the city authorities, and you having decided in 1904 that a further examination of them by me was unnecessary.

I have omitted, also, a detailed examination of the Annual Membership Dues Account, as per like instruction in 1904. These dues are received by the Director-in-Chief, and forwarded by him to the Treasurer, the former keeping a detailed record of the same.

Respectfully submitted,
(signed) J. L. MERRILL,
Special Auditor.

VOL. 6 NO. 21

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

[ISSUED SEPTEMBER 27, 1910]

TABLE OF CONTENTS

PAGE

BOTANICAL CONTRIBUTIONS:

Bolivian Mosses, Part II, by R. S. WILLIAMS. [*Issued 1910*] 227

Critical Notes on New or Little Known Species in the Herbarium of the New York Botanical Garden, by B. P. G. HOCHREUTINER. [*Issued Ap 15, 1910*] 262

A Phytogeographic and Taxonomic Study of the Southern California Trees and Shrubs, by LE ROY ABRAMS. [*Issued S 27, 1910*] 300

Each paper was issued separately, in advance, on the date indicated.

BULLETIN

OF

The New York Botanical Garden

Vol. 6. No. 21.

BOTANICAL CONTRIBUTIONS.

Bolivian Mosses. Part II.

BY R. S. WILLIAMS.

MIELICHHOFERIA ANDINA Sull.

On divide between Lake Titicaca and Sorata, 4300 meters, Aug. 29, 1901 (1890). Specimens paroicous: segments of endostome variable, sometimes over 20 μ wide ½ up, not papillose, from low basal membrane; spores rough, up to 20 μ in diameter. Original specimens of the U. S. Expl. Exp. show rough spores up to 24 μ in diameter. Also collected at Juliaca, Peru, May 16, 1902, on sandstone (2792).

Mielichhoferia subglobosa sp. nov.

Paroicous: in compact yellowish-green tufts up to 2.5 cm. high; leaves erect, ovate-lanceolate, the upper larger, about 1.3 mm. long, serrulate toward apex, with a stout nerve serrulate above on the back and vanishing below apex or excurrent into a short point; median leaf cells rather irregular, up to about 10 μ wide and 60 μ long; perichaetial leaves very similar to stem leaves; capsule subglobose, 1.5 mm. high with low-convex, scarcely mamillate lid, more or less nodding on a flexuous seta 12 mm. high; exothecal cells one half down capsule up to 30 μ wide and 40–60 μ long; annulus large; no outer peristome, the inner of smooth segments about 12 μ wide half way up, from a low basilar membrane; spores nearly smooth, up to 16 μ in diameter.

In crevices of rock at 4500 meters on Mount Sorata, Sept. 27, 1902. This species is near *M. modesta* C. M. but is a larger plant with longer, narrower pointed leaves as well as different capsule (1885).

MIELICHHOFERIA CAMPYLOCARPA Hook. and Arn.

Pelichuco, May 3, 1902, at 3100 meters elevation (2793). Near Sorata at 4200 meters, Sept. 9, 1901 (1880). These specimens are similar to those called *macrotheca* Hampe MS. (Peru, coll. Jay) and which have been correctly referred, I believe, to *campylocarpa*, although I have not seen specimens of the latter from the type locality. The specimens all show a more or less papillose endostome of narrow segments from a low basilar membrane and nearly smooth spores from 14 μ to 16 μ in diameter. The leaf cells are narrow, mostly 6 μ or 7 μ wide.

MIELICHHOFERIA CAMPYLOTHECA C. M.

On divide between Lake Titicaca and Sorata, 4200 meters elevation, Aug. 29, 1901 (1881). I have seen no specimens for comparison but these plants have somewhat rough spores, up to 20 μ in diameter as given in Engler & Prantl by Brotherus, also the median leaf cells are up to 10 μ wide and segments of endostome not papillose, characters which will perhaps separate it from the preceding species.

MIELICHHOFERIA LONGIPES C. M.

Pelichuco, May 1, 1902 (2790). Basilar membrane with more or less rudimentary processes between the segments; nearly smooth spores up to 16 μ; pedicel up to 6 cm.

MIELICHHOFERIA LINDIGII Hampe.

Near Sorata, at 3000 meters, Sept. 8, 1901 (1886). Specimens compared with material named by Hampe and they differ in no essential respect. The outer peristome is wanting, the inner, from a slightly exserted membrane, is smooth, the segments with a distinct median line. In width the segments vary largely in the same peristome. Spores nearly smooth, up to 16 μ. The highly convex lid is often acute or apiculate rather than obtuse. This species is most closely related to *Andina* of any of the preceding. In Engler and Prantl, *Lindigii* is placed among those with a double peristome.

HAPLODONTIUM JAMESONI (Taylor) Hampe.

Pelichuco, May 4, 1902. Common along streams at 3300 meters (2801). Near Sorata, 3000 meters, Sept. 8, 1901 (1884); also at La Paz.

STABLERIA TENELLA (Mitt.) Broth.

Sorata, 2500 meters, June 3, 1902. On trees (1706).

ORTHODONTIUM CONFINE Hampe.

Between Tolapampa and Mapiri at 2300 meters, Sept. 11, 1901 (2899); also in decayed wood near Mapiri, at 900 meters, June 17, 1902 (1721).

LEPTOBRYUM WILSONI (Mitt.) Broth.

Yura on railway just above Arequipa, Peru, 2400 meters, on shaded rock walls, Aug. 11, 1901 (2806).

POHLIA SPECTABILIS (C. M.) Broth.

Below Pelichuco, 2800 meters, April 30, 1902, on rock (2789).

POHLIA CRUDA (L.) Lindb.

Above Sorata, 4250 meters (1911). Sterile specimens apparently of this species growing with *Bryum flexisetum.*

Pohlia Apolensis sp. nov.

Dioicous; male plants with solitary terminal flowers, the perigonial leaves with an ovate, concave base gradually narrowed to a broad, lanceolate more or less elongate, serrulate apex, erect or slightly reflexed: fertile plants slender, with few, erect branches, up to 1.5 cm. high; leaves oblong-lanceolate, the perichaetial 2 mm. long, serrulate above, borders mostly flat, the stem leaves much shorter, distant on stems and long-decurrent; costa smooth on back, percurrent or ending just below apex; median leaf cells about 8 μ wide by 60 μ long; capsule nodding, obovate, 2–2.5 mm. long, with a conical, mamillate lid; exothecal cells mostly hexagonal, up to 30 μ in diameter, not sinuous-walled; stomata superficial; annulus compound; seta up to 2.5 cm. high; peristome pale, double, the outer of lanceolate, rather irregular, obtusely pointed teeth without lamellae, finely papillose on both sides and 60 μ wide at base; the inner of a basilar membrane one third the height of peristome, bearing segments as high as the teeth, finely papillose and with sometimes broad, often rounded appendages above; no intermediate cilia; spores smooth, up to 16 μ.

Apolo, 1500 meters elevation on sandy soil, Feb. 19, 1902 (1882). This species has a superficial resemblance to small forms of *Mniobryum albicans*.

Brachymenium dimorphum sp. nov.

Dioicous; male plants very small, 3 or 4 mm. high, with solitary, terminal flowers and radicles at base attaching it to fertile plant; antheridial leaves ovate, acute, serrulate above and costa scarcely percurrent, with marginal cells scarcely forming a distinct border: fertile plants with stems tomentose and leafless below, up to 2.5 cm. high, with leaves when dry more or less appressed and twisted about stems; leaves ovate or ovate-lanceolate to elongate-oblong, acute, the upper and perichaetial, 2 mm. long, serrulate above, with stout costa excurrent into a short point; margins flat and bordered with one or two rows of greatly elongated, narrow, thick-walled, golden-brown cells; median leaf-cells elongate-hexagonal, about 20 × 40 μ below cells more or less rectangular and nearly square at basal angles; cell walls, excepting border, thin but somewhat pitted throughout; capsule erect, ovate-cylindrical to nearly cylindrical, with lid up to 4.5 mm. high, on a seta up to 2 cm. high; lid narrowly conical, its height about twice basal diameter; annulus large; peristome of slender, red, papillose teeth about 0.7 mm. long and 25 μ wide at base with 12 or 14 lamellae on inner face and median line indistinct; the inner, a papillose red membrane extending above the mouth about one fifth the height of teeth, with an irregular, slightly incised margin; smooth, pale spores up to 12 μ.

New Brazil, upper Mapiri region, 1500 meters elevation, on trees, June 15, 1902 (1803). In habit this species is like *B. Regnellii* but leaf margin different.

ACIDODONTIUM MACROPOMA (C. M.) Broth.

Tacacoma, on trees, June 10, 1902, elevation 3100 meters (1901).

ANOMOBRYUM FILIFORME (Dicks) Husn.

Pelichuco, 3200 meters, on wet earth, May 4, 1902 (2804). Sorata, 2500 meters, on dry bank of sandy clay, June 4, 1902

(1887). La Paz, 3300 meters, sterile specimens. There seems to be no specimen of *A. orbiculatum* (Mitt.), in the Mitten herbarium. It should not unlikely be referred to *filiforme*. *A. prostratum* (C. M.) Besch. is also, apparently, only a robust, elongated form of the same species. Cross-sections of stem and leaves of no. 2804 from Pelichuco are similar to those of European plants, as are cross-sections of no. 1081, Funck & Schlim, the type collection of *A. prostratum*.

BRYUM FLEXISETUM Mitt.

Between Sorata and Ingenio at 4500 meters elevation, Sept. 27, 1902 (1899). Specimens with antoicous inflorescence and smooth spores up to 18 μ.

BRYUM MAYENSE Spruce.

San Juan, on trail to Rio Lanca, March 22, 1902 (1723).

BRYUM ARGENTEUM L.

Near Pelichuco, 3100 meters elevation, April 30, 1902 (2799). Near Ingenio, 4000 meters, Sept. 11, 1901 (2900). Apolo, 1500 meters, July 10, 1902 (1894). Santa Cruz, 1500 meters, April 24, 1902 (2800). The latter are the smallest specimens collected, growing in depressed tufts, with stems 2 mm. high and seta up to 1 cm. The finest specimens are from Pelichuco with stems up to 2 cm. high and the seta 2.5 cm.

BRYUM CONCAVUM Mitt.

La Paz, 3600 meters elevation, May 26, 1902 (1900). Springs of Yura, above Arequipa, Aug. 11, 1901 (2798). These specimens mostly have two short, inappendiculate cilia between the segments of inner peristome. Outer plates of teeth minutely granulose. Spores slightly roughened, up to 20 μ. These characters agree with those of the type collection. No gemmæ noticed in any of the specimens.

Bryum Atenense sp. nov.

Dioicous; male plant simple, 4 mm. high with single terminal flower; outer perigonial leaves similar to stem leaves, inner much shorter, rotund-ovate with scarcely excurrent nerve: fertile plants with stems 3 or 4 mm. long and few branches often somewhat longer; leaves when dry spirally twisted about stem; the upper and outer perichaetial leaves, with blade about 1.7 mm. long and excurrent costa 0.3 mm. long, varying from ovate to oblong-lanceolate and oblong-linear; leaf margin flat and entire all round with an indistinct border of mostly one row of very narrow thin-walled cells; stem leaves few, not decurrent, keeled along the costa with blade nearly flat on either side; median leaf-cells elongate-hexagonal, thin-walled, about 16 μ wide and 40 μ long; capsule, on a seta up to 3 cm. high, dark red, pendant, somewhat contracted below the mouth when empty with oblong sporangium tapering into a somewhat shorter collum; lid convex-mamillate; annulus large; teeth of exostome finely granulose on outer face, the plates about 16 μ wide by 40 μ long; inner lamellae up to 28; segments of endostome with rounded apertures and three appendiculate cilia between on a basilar membrane over one half the height of teeth; spores nearly smooth, up to 12 μ.

Near Aten on rather dry clayey soil at 1400 meters elevation, June 18, 1902 (1897). This species is near *elegans* which has broader, shorter leaves with different border.

BRYUM CAVUM C. M.

Apolo, 1500 meters elevation, July 10, 1902 (1898).

BRYUM DENSIFOLIUM Brid.

Near Aten, 1600 meters, June 19, 1902 (1907).

RHODOBRYUM BEYRICHIANUM (Hornsch.) Paris.

Trail between San José and Apolo, Feb. 12, 1902, at 1800 meters elevation (1905). Near Yuyu, 1100 meters, June 18, 1902 (1904).

RHODOBRYUM GRANDIFOLIUM (Tayl.) Paris.

Santa Anna, Apolo region, 1800 meters, July 29, 1902 (1906). Rio Pelichuco, 2700 meters, April 28, 1902 (2796).

MNIUM LIGULATUM C. M.

Santa Cruz, 1600 meters elevation, on wet log by waterfall, Aug. 25, 1902 (1893). Near Aten, on rock, at 1500 meters, Aug. 4, 1902 (1892). These specimens have rather larger leaves than any European or N. A. specimens of *rostratum* I have seen, measuring up to 8 mm. long and 3.5 mm. wide. The largest European specimens measured were 6 by 3 mm. Also the Bolivian plants have large hyaline cells, up to 35 μ wide and 55 μ long, on either side of costa the greater part of its length, a character not noticed in *rostratum*. The apex of leaf varies considerably in all the specimens, and does not offer any constant difference.

RHIZOGONIUM SPINIFORME (L.) Bruch.

Apolo, 1600 meters, July 7, 1902 (1854). Common in the region of Apolo from 1200 to 1800 meters on fallen trunks and roots of trees.

LEIOMELA BARTRAMIOIDES (Hook.) Par.

Near Aten, Aug. 16, 1902, 1500 meters (1769).

BARTRAMIA ITHYPHYLLOIDES Schimp.

Pelichuco, 3100 meters, April 30, 1902 (2824).

BARTRAMIA FRAGILIFOLIA C. M.

Tacacoma, 3050 meters, June 10, 1902 (1908).

PHILONOTIS TENELLA (C. M.) Besch.

Tumupasa, 430 meters, Dec. 12, 1901 (1917).

PHILONOTIS MINUTISSIMA (C. M.) Par.

Isapuri, Rio Mapiri, 450 meters elevation, Oct. 1, 1901 (1916). Apolo, 1500 meters, on dry soil, July 10, 1902 (1913). Rio Pelichuco, 2400 meters, April 27, 1902 (2826). Sorata, 2300 meters, Sept. 4, 1901 (2936).

Philonotis operta sp. nov.

Dioicous; male plants slender with few branches and bud-like flowers, the perigonial leaves from a golden-brown, ovate-concave base to a gradually narrowed, long-lanceolate, serrulate, erect point, indistinctly costate: fertile plants in soft low mats, densely tomentose within, with short stems (under 1 cm. long), in cross-section slightly elongate-pentagonal, 180 μ in greater diameter, the rind of two rows of thick-walled cells and an outer row of thin-walled, medium-sized cells, often collapsing and indistinct; central stand rather small with poorly marked border; the very slender branches in cross-section, similar to stems but only 80 μ in greater diameter; leaves distant and spreading either dry or moist, papillose on both sides and more or less recurved on margin; stem leaves 1 mm. long, gradually narrowed from a broad base to a narrowly lanceolate, serrulate point formed by the excurrent costa with basal cells rectangular, about 12 μ wide and 2–5 times longer; branch leaves shorter and costa scarcely excurrent; perichaetial leaves much like stem leaves but with a longer, more slender and smoother point, with costa indistinct; capsule irregular, nodding, striate, with low convex lid, on a seta about 1.75 cm. high; teeth of exostome orange-brown, 85 μ wide at base, the outer plates finely granulose, about 14 lamellae on inner face and apex finely papillose; segments of endostome a little shorter than teeth, split along the median line above with a few perforations below and the points papillose-striate in vertical lines; spores rough, mostly slightly elongated, 16 × 20 μ.

Palamos near Mapiri, 1000 meters elevation, June 13, 1902 (1909). This plant in many respects is near *P. radicalis*, differing especially in its dioicous inflorescence.

PHILONOTIS ANGULATA (Tayl.) Broth.

Sorata, 2400 meters elevation, on rock, Sept. 1, 1901 (1918). Cross-sections of stem 320 μ in diameter with a well-defined central-strand 120 μ in greater diameter and ground tissue gradually changing into the rind with an outer wall of larger thin-walled cells rather incomplete.

PHILONOTIS GRACILENTA (Hampe) Jaeg.

Near Tolapampa, 3600 meters elevation, Sept. 11, 1901 (1915). Apolo, 1500 meters, on wet ground, June 24, 1902 (1910).

BREUTELIA NUTANS Mont.

Pelichuco, 3300 meters, May 4, 1902 (2825). Near Sorata, 3000 meters, growing amongst brush, Aug. 27, 1901 (2134).

BREUTELIA TOMENTOSA (Sw.) Schimp.

Pelichuco, 3300 meters, April 30, 1902 (2788).

? BREUTELIA WAINIOI Broth.

Above Tolapampa, 4000 meters, Sept. 11, 1901 (1716).

I refer these sterile specimens to *Wainioi*, of which I have seen no specimens, with considerable doubt, although they come near the description of that species except that they are not tomentose to apex and the branches are mostly few, long and irregular. The Bolivian specimens are evidently the same as those under no. 245 of P. Dusen from southern Chili called *B. plicata*, but with leaf cells above narrowly linear as in my specimens.

CATHARINEA POLYCARPA (Schimp.) Müll.

Between Aten and Apolo, 1800 meters, on bank of stream in woods, Aug. 19, 1902 (1924).

PSILOPILUM GYMNOSTOMULUM (C. M.) Par.

Near summit of Divide between Lake Titicaca and Sorata, 4200 meters elevation, Aug. 29, 1901 (1919).

PSILOPILUM TRICHODON (Hook. fil. et Wilson) Mitt.

Near Tolapampa, 4000 meters, Sept. 11, 1901 (1937).

POLYTRICHADELPHUS GROSSIDENS (C. M.) Par.

Tolapampa, 3600 meters, Sept. 11, 1901 (1935). Only a few poor specimens of apparently this species obtained.

POLYTRICHADELPHUS ARISTATUS (Hampe) Mitt.

Above Tolapampa, 3900 meters, Sept. 11, 1901 (1934). If this determination is correct, *aristatus* has the costa smooth on the back as given by Mitten, not toothed as in Engler & Prantl. Nat. Pfl. Part 222 : 683. 1905.

POLYTRICHADELPHUS UMBROSUS Mitt.

Tolapampa, 3600 meters, Sept. 12, 1901 (1936).

POLYTRICHADELPHUS RUBIGINOSUS Mitt.

Apolo region, 1200 to 1800 meters, Feb. 12, 1902 (1933).

POGONATUM ABBREVIATUM Mitt.

APOLO, July 9, 1902, 1500 meters elevation (1926). Consata, 1200 meters, June 12, 1902 (1927).

Pogonatum laxirete sp. nov.

Dioicous; very slender male plants with 1–3 flowers about

2.5 mm. in diameter: fertile plants unbranched, up to 5 cm. high; leaves when dry mostly abruptly spreading from the clasping base and incurved above, more or less linear-lanceolate, serrate from a little below the middle to the acute apex, up to 6 mm. long and 1 mm. broad, with about 34 lamellae 2 cells high on upper surface, the upper cell in cross-section of lamellae smooth, scarcely enlarged, nearly round; leaf blade and margin, of single layer of cells, extending for 8 or 10 rows of cells on either side of lamellae about one half down leaf; leaf cells in blade one half down, mostly hexagonal, about 16 μ in diameter, often slightly transversely elongated, the basal cells rectangular, pale, 12–16 μ wide and 2–4 times longer than wide, the cells throughout leaf with scarcely or not thickened walls; costa with a few scattered teeth on back toward apex, about 100 μ wide at base; capsule on a seta 2 cm. high, curved, nodding, about 2.5 mm. long, mamillose on surface with about 5 ribs extending its entire length; peristome teeth about 200 μ high and 65 μ wide; lid not seen; calyptra densely tomentose, brownish-white; spores smooth, up to 12 μ in diameter.

Palamos near Mapiri, 700 meters, June 13, 1902 (1925). This species belongs near *P. laxifolium* Besch. but is a much more slender plant with thinner cell-walls in the leaves.

POGONATUM POLYCARPUM (Schimp.) Broth.

Pelichuco, 3300 meters, May 1, 1902 (2840). Near Sorata 2500 meters, Sept. 27, 1902 (1928).

POLYTRICHUM ANTILLARUM Rich.

Near Aten, 1850 meters, Aug. 7, 1902 (1924): these specimens, growing in a uniformly wet, shady place, have stems up to 38 cm. high. Sorata, 2400 meters, Sept. 3, 1901 (1930), growing in a dry exposed locality with stems 2 cm. high. Pelichuco, May 2, 1902 (2838) at 3300 meters. Tolapampa, 3600 meters, Sept. 25, 1902 (1932). Rio Tuichi, April 27, 1902 (2836). I believe *P. aristiflorum* Mitt. cannot be distinguished from the above.

HEDWIGIA ALBICANS (Web.) Lindb.

Near Pelechuco, 3000 meters, April 30, 1902 (2850).

HEDWIGIDIUM IMBERBE (Sm.) Bry. Eu.

Above La Paz, 3600 meters, Aug. 24, 1901 (2819). Ingenio, Sept. 10, 1901, on rock (1725). The leaves often end in a pale, flexuous hair point, also seen in European specimens.

Rhacocarpus squamosus sp. nov.

Plants in dense mats, about 7 cm. high, rather pale brown above, much darker below; stems with irregularly scattered, spreading branches; stem-leaves oblong-panduriform, 2 mm. long and up to 1 mm. wide, entire and revolute on margin below with a red border gradually widening into the thick-walled alar cells with narrow lumen, minutely denticulate above with incurved margin toward acute apex which bears a short (0.1 mm. long) entire apiculus; branch leaves similar to stem leaves but narrower; perichaetial leaves convolute, 2.5 mm. long, with apex truncate or somewhat retuse with a short apiculus, in length about that of the stem-leaves; pedicel 12 mm. long, rough at apex; capsule without lid 2 mm. high; lid and calyptra not seen; spores pale, slightly rough, about 20 μ in diameter.

Near Tolapampa, 3600 meters, Sept. 11, 1901 (2894). This plant seems to be quite distinct in its broad, short-pointed, scale-like leaves with thick-walled alar cells.

RHACOCARPUS HUMBOLDTII (Hook.) Lindb.

Above Tolapampa, 3600 meters, Sept. 11, 1901 (1923). A rather small form of the species.

PSEUDOCRYPHAEA FLAGILIFERA (Brid.) E. G. Britton.

San Buena Ventura, 425 meters elevation, on tree trunks, Nov. 15, 1901 (1988). Near Aten, 1200 meters, on rock, Aug. 8, 1902 (1989).

ACROCRYPHAEA JULACEA (Hornsch.) Bryol. Eur.

Mapiri, 550 meters, on trunks of Cacao, Sept. 18, 1901, (1987).

ACROCRYPHAEA GARDNERI (Mitt.) Jaeg.

Rio Pelichuco, 2000 meters, April 29, 1902 (2853). Santa Barbara, 1500 meters, Aug. 30, 1902 (1986).

CRYPHAEA LATIFOLIA Mitt.

Sorata, 2400 meters, Sept. 3, 1901 (1984).

CRYPHAEA RAMOSA Wils.

Above Sorata, 3000 meters, Sept. 8, 1901 (1983).

CRYPHAEA PATENS Hornsch.

Sorata, 2400 meters, Sept. 3, 1901 (2877).

CRYPHAEA PILIFERA Tayl.

Sorata, 2400 meters, June 3, 1902 (1985).

PRIONODON BOLIVIANUS C. M.

Near Pelichuco, 2700 meters, April 30, 1902 (2762).

PRIONODON DIVARICATUS Mitt.

Rio Pelichuco, 2500 meters, April 29, 1902 (2765).

PRIONODON LAEVIUSCULUS Mitt.

Between San José and Apolo, 1200 meters elevation, Feb. 12, 1902 (2895). These specimens sometimes have slender flagellae 5 or 6 cm. long on the secondary stems, also the basal cells toward costa are relatively longer and narrower than is figured on p. 764 of part 223, Engler and Prantl, in this latter respect agreeing with specimens in the Mitten herbarium. Near Aten, 1550 meters, Aug. 6, 1902 (2004). The Aten specimens differ somewhat in having a much fewer number of cells at basal angles transversely elongated but otherwise they seem to come very near this species.

PRIONODON DENSUS (Sw.) C. M.

Near Aten, 1200 meters, Aug. 1, 1902 (2003).

ORTHOSTICHIDIUM PENTAGONUM (Hampe and Lorentz) C. M.

Tumupasa, 430 meters, Jan. 14, 1902 (1946).

PIREA POHLII (Schwaegr.) Broth.

San Buena Ventura, 190 meters elevation, Nov. 3, 1901 (1982).

PTEROBRYUM DENSUM (Schwaegr.) Hornsch.

Tigrepata, 1500 meters, Feb. 12, 1902 (1981).

PTEROBRYOPSIS STOLONACEA (C. M.) Broth.

Near Pelichuco, 3000 meters, April 30, 1902 (2764).

These specimens have the costa often forking above as do the specimens of Lorentz from Argentine. The spindle-shaped propagulae are very abundant in dense clusters in the axils of the leaves. They have 7 or 8 cross-walls and measure about 125 μ by 35 μ.

ORTHOSTICHOPSIS CRINITA (SULL.) BROTH.

Mapiri, 550 meters, Sept. 13, 1901 (1947).

Squamidium diversifolium sp. nov.

Evidently dioicous, no antheridia found, archegonial flowers abundant: stems creeping, bearing julaceous, often crowded branches a centimeter or two long and 1 mm. in diameter when moist, or with the tips of the branches lengthening out into much longer, flagelliform, very slender, curved or pendent branches up to 12 cm. long with sometimes short-scattered branchlets; leaves of the stouter branches about 1 mm. long, decurrent, broadly ovate or rotundate, very concave, entire or minutely serrulate above with short, acute, mostly entire point, ecostate to narrowly costate three fourths up; leaf-cells above all narrow, medium about 5 μ wide and 55 μ long, basal slightly thickened and pitted, alar forming distinct, convex clusters of nearly square cells; leaves of the flagelliform branches ovate-lanceolate, the blade 1.5 mm. long, gradually narrowed to a flexuous point up to 1 mm. long, with some short, scattered, often recurved teeth at its base; perichaetial leaves mostly ecostate, nearly entire, the inner 1 mm. long, gradually narrowed to a rather short, erect, lanceolate apex, the outer much shorter: fruit not obtained.

On Pelichuco River below Pelichuco, 2600 meters elevation, April 30, 1902 (2856). Tigrepata, 1500 meters, Feb. 12, 1902 (2137). The latter specimens with long pendent branches. This species is near *S. nitidum* (Sull.) Broth.

SQUAMIDIUM LEUCOTRICHUM (Tayl.) Broth.

Near Apolo, 1900 meters, July 25, 1902 (1949).

PILOTRICHELLA VIRIDIS (C. M.) Jaeg.

Tumupasa, 430 meters, Jan. 14, 1902 (1945). Santa Barbara, Apolo region, 1550 meters, Aug. 30, 1902 (1944).

PILOTRICHELLA FLEXILIS (Sw.) Jaeg. et Sauer.

Near Pelichuco, 2900 meters, April 30, 1902 (2763).

PAPILLARIA NIGRESCENS (Sw.) Jaeg.

Apolo, 1500 meters, June 28, 1902 (2126). Growing in large mats on dry, clayey soil.

These specimens do not differ in color, in width of leaf, in leaf-cells or in variation of apex of leaf from specimens collected by Austin in Gainesville, Fla., and which he considered to be *nigrescens*. They are without doubt the plant called *appressum* C. M. and constitute the stouter form of *nigrescens*, which is found also in Mexico, collected by J. G. Smith at Orizaba. I have compared the above specimens with a fragment of the Swartz type which is rather more slender than the average of these specimens, but branches can be picked out from any of them that match the type both in size and microscopic characters.

PAPILLARIA IMPONDEROSA (Tayl.) Broth.

Santa Cruz, near Apolo, 1600 meters, April 25, 1902 (2761). *P. Oerstediana* (C. M.) Jaeg. I am unable to distinguish from *imponderosa*.

METEORIUM ILLECEBRUM (C. M.) Mitt.

Trail between San José and Apolo, Feb. 11, 1902 (2138). *M. cladomniella* C. M. appears not to differ specifically from this.

FLORIBUNDARIA TENUISSIMA (Hook. et Wils.) Broth.

Near Pelichuco, 2500 meters, April 30, 1902 (2760). Tacacoma, 2900 meters, June 10, 1902 (1948).

LINDIGIA ACICULATA (Tayl.) Jaeg.

Santa Barbara, 1550 meters, Apolo region, Aug. 30, 1902 (2880).

METEORIOPSIS REMOTIFOLIA (Hornsch.) Broth.

Santa Barbara, 1550 meters, Aug. 29, 1902 (1941).

METEORIOPSIS ONUSTA (Spruce) Broth.

Trail between San José and Apolo, 1200 meters, Feb. 11, 1902 (1942).

METEORIOPSIS PATENS (Hook.) Broth.

San José to Apolo, 1200 meters, Feb. 11, 1902 (1940). Near Aten, 1500 meters, July 25, 1902 (2937).

METEORIOPSIS RECURVIFOLIA (Hornsch.) Broth.

San José to Apolo trail, Feb. 11, 1902 (1943).

PHYLLOGONIUM FULGENS (Sw.) Brid.

San José to Apolo trail, Feb. 11, 1902, at 1200 meters (1939).

PHYLLOGONIUM VISCOSUM (Palis.) Mitt.

Trail between San José and Apolo, 1200 meters, Feb. 12, 1902 (1938).

NECKERA UNDULATA (Palis.) Hedw.

Santa Cruz, on trees, 1500 meters, Aug. 25, 1902 (2000). Summit between San José and Tumupasa, Jan. 30, 1902 (2940). Near mouth Rio Huanai, Apolo region, on rock, 1050 meters, Aug. 10, 1902 (2001). Rio Mapiri, 450 meters, on rock, Sept. 27, 1901 (2941).

NECKERA DISTICHA Hedw.

Rio Mapiri, 450 meters, Oct. 1, 1901 (1999).

NECKERA LINDIGII Hampe.

Near Pelichuco, 2500 meters, April 30, 1902 (2810).

NECKERA EUCARPA Schimp.

Peluchino, 3300 meters, May 4, 1902 (2808). Near Sorata, 2700 meters, Sept. 8, 1901 (1998). These specimens grow in deep, loose tufts, with stems up to 15 cm. high. *N. cyathicarpa* Hpe. evidently belongs here; the stems bear paraphyllia and teeth of peristome are cross-striate at base, the leaves not plicate.

Neckera eucarpa secundifolia var. nov.

Tacacoma, 3150 meters, on trees in exposed place, June 10, 1902 (1997). This variety is a darker, shorter stemmed plant, with the leaves all secund instead of only at the tips of the branches as in the species.

NECKERA JAMESONI Taylor.

Sorata, 2700 meters, Sept. 8, 1901 (1995), on trees. Pelichuco, 3200 meters, on the ground amongst brush, May 4, 1902 (2809). Hills above Mollendo, Peru, Aug. 5, 1901, apparently a stunted form growing on bushes (2891).

POROTRICHUM EXPLANATUM Mitt.

Santa Cruz, 1800 meters, on rock by stream, Aug. 25, 1902 (1978). The small amount of material collected of this species shows a plant rather lower than the type with pedicel 5 or 6 mm. longer. In the Mitten herbarium the single fruiting specimen referred to in Jour. Linn. Soc. **12**: 468, has always remained the only specimen in fruit in his collection. It shows a stem 11 cm. long with three seta, bearing capsules without lids, the longest seta being 19 mm. long, the other two a trifle shorter.

POROTRICHUM FASCICULATUM (Sw.) Mitt.

Santa Cruz, 1800 meters, Aug. 25, 1902, on damp shaded rock by stream (1980). Isapuri, Mapiri river, Oct. 1, 1901 (1979).

ENTODON BEYRICHII (Schwaegr.) C. M.

Apolo, 1500 meters, on earth, June 27, 1902 (1972). Mapiri, 480 meters, on earth, Sept. 17, 1901 (1970).

ENTODON ERYTHROPUS Mitt.

Sorata, 2400 meters, on earth and rock, June 5, 1902 (1971).

ENTODON JAMESONI (Tayl.) Mitt.

Sorata, 2400 meters, on trees, Sept. 3, 1901 (1969). Tacacoma, 3000 meters, on trees, June 10, 1902 (1724).

ENTODON HAMPEANUS C. M.

Rio Pelichuco, 2400 meters, on rock, April 28, 1902 (2750).

CAMPYLODONTIUM ONUSTUM (Hampe) Jaeg.

Apolo, 1500 meters, on dry clayey soil, March 9, 1902 (1966). Apolo, on bark, July 10, 1902 (1967).

ERYTHRODONTIUM SQUARROSUM (C. M.) Par.

Apolo, 1500 meters, March 8, 1902 (1974).

ERYTHRODONTIUM LONGISETUM (Hook.) Par.

Apolo, 1500 meters, on shaded ground, Feb. 25, 1902 (1973).

ERYTHRODONTIUM GERMAINII (C. M.) Par.

Apolo, July 10, 1902, on tree trunk (1975). This seems to differ chiefly from the preceding in having leaves rather more denticulate at the apex and always ecostate as well as in smaller size of leaf.

STEREOPHYLLUM BREVIPES (C. M.) Mitt.

San Juan, 1160 meters, April 4, 1902, on dead log (2807).

STEREOPHYLLUM PSEUDORADICULOSUM (C. M.) Par.

Achiquiri, near Mapiri, on decayed wood, 700 meters, June 17, 1902 (2120).

STEREOPHYLLUM SUBCHLOROPHYLLUM (C. M.) Par.

Near San José, Rio Mapiri, 600 meters, June 13, 1902 (2122). Tumupasa, 430 meters, Jan. 15, 1902 (2897).

STEREOPHYLLUM FLACCISETUM (C. M.) Paris.

Tumupasa, 430 meters, on rock, Jan. 10, 1902 (2121); on tree trunk, Jan. 26, 1902 (2898). Determined from description only. These specimens are both autoicous and possibly not correctly referred here as Brotherus gives the species as dioicous. Carl Mueller in *Flora*, 1897, p. 340, does not state the kind of inflorescence.

FABRONIA POLYCARPA Hook.

Apolo, 1500 meters, on tree trunk, April 14, 1902 (1991). Apolo, on stone wall, July 4, 1902 (1992). These latter specimens have the leaves rather more serrate with short, scattered teeth, than the specimens on trees, although in both the leaves are often entire.

FABRONIA ANDINA Mitt.

Sorata, 2400 meters, on trees, June 3, 1902 (1993). These specimens have the peristome teeth scarcely or not striate on the surface, with apex truncate and extending only about 80 μ above the mouth.

FABRONIA SINGULIDENS C. M.

Pelichuco, 3300 meters, on rock, May 5, 1902 (2774). By the stem-leaves this species is rather related to *Andina*, but the perichaetial leaves are more or less truncate and irregularly serrulate above, sometimes with a short abrupt point, and the peristome teeth extend about twice as far above the mouth of the capsule, with mostly acute, irregularly erose apex. The surface of the teeth is striate in various directions.

ANACAMPTODON CUBENSE (Sull.) Mitt.

Apolo, 1500 meters, above base of trees, Feb. 21, 1902 (1994).

SCHWETSCHKEA BOLIVIANA C. M.

Pelichuco, 3300 meters, May 5, 1902, on rock (2775).

HELICODONTIUM TENUIROSTRE Schwaegr.

Apolo, 1500 meters, Feb. 25, 1902 (2014). Santa Cruz, 1700 meters, on rock, Aug. 24, 1902 (2013). Near Aten, on old log, July 26, 1902, 1200 meters (2017).

HELICODONTIUM CAPILLARE (Sw.) Jaeg.

Mapiri, 480 meters, at base of tree, Sept. 18, 1901 (2016).

Helicodontium spicatinervum sp. nov.

Autoicous: in low, loosely cespitose mats with creeping stems and irregular branches about one half cm. long; stem-leaves not plicate, scarcely 1 mm. long, erect or somewhat spreading when dry, rather widely spreading when moist, from a broadly ovate base gradually tapering to a short, very acute apex, finely serrulate all round to the reflexed border near base, with stout nerve extending about two thirds up and ending in short spine on back; leaf-cells narrow and thin-walled above, toward the basal angles becoming broader and shorter, the median cells up to 6 μ wide and 40 μ long; branch-leaves shorter and broader pointed; perichaetial leaves pale, more or less costate below, the inner gradually lanceolate pointed, serrulate on margin, up to 1.6 mm. long;

capsule erect, ovate, 1.25 mm. long without lid, with an obliquely rostrate lid about .75 mm. long, on a smooth seta 8 or 9 mm. high; outer peristome with teeth cross-striate below and somewhat papillose above; segments of inner peristome narrow, with narrow slits along the median line and sometimes very short, rudimentary cilia between; annulus narrow, one or two rows of cells high; spores up to 12 μ in diameter.

Pelichuco, 3350 meters, May 5, 1902, on tree (2773). This species is near *obliquerostratum*, but that is a smaller plant with somewhat rough seta, leaf-cells shorter and broader and apex of leaf wider. *H. laevisetum* has a much narrower leaf of different outline.

DALTONIA LONGIFOLIA Tayl.

Rio Pelichuco, 1950 meters, April 29, 1902, on trees (2751). Santa Barbara, 1800 meters, Aug. 30, 1902 (1816). Taylor describes the leaves of this species as "integerrimo" but in specimens, apparently from the type locality, the leaf is minutely serrulate above as in Pelichuco specimens.

DALTONIA IRRORATA Mitt.

Sorata, 2500 meters, on tree, Sept. 3, 1901 (2942). These specimens were nearly concealed by other mosses growing about them and are smaller than the type.

ADELOTHECIUM BOGOTENSE (Hampe) Mitt.

Near Apolo, 1800 meters, July 25, 1902 (1965). Hampe describes the costa as ending below the apex but in specimens of Lindig from apparently the type locality the narrow, elongated cells of costa extend into the apiculus in many of the leaves just as in these specimens, the colored part of costa vanishing in both specimens some distance below apex; also the leaf-cells on both surfaces are smooth, not papillose, as figured in Engler and Prantl, p. 924. The Apolo plants are a little larger, with longer apiculus and margin more distinctly crenulate than in Lindig's specimen, which is not apparently in the best of condition.

CYCLODICTYON ALBICANS (Sw.) Broth.

Lower Rio Çocos near Rio Lanca, 950 meters, March 25, 1902, on decayed log (1960). These specimens have flowers autoicous or sometimes synoicous, they seem to differ somewhat also in having rather longer, more slender-pointed perichaetial leaves than are found in West Indian specimens.

CYCLODICTYON HUMILE (Mitt.) Broth.

Isapuri, 450 meters, on decayed log and rock, Oct. 19, 1901 (1959). San Buena Ventura, on rock, 190 meters, Nov. 15, 1901 (2065). San Juan, 975 meters, March 22, 1902, on old log (1958).

CYCLODICTYON AERUGINOSUM (Mitt.) Broth.

Near Aten, 1050 meters, on rock, Aug. 3, 1902 (1952). Isapuri, 450 meters, Sept. 17, 1901 (1955).

CALLICOSTELLA RIVULARIS (Mitt.) Broth.

Isapuri, Sept. 27, 1901, on rock (2882). These specimens should, perhaps, be referred elsewhere. They are rather larger, more yellowish, with somewhat narrower leaves than the specimens of *rivularis* I have seen.

CALLICOSTELLA PALLIDA (C. M.) Jaeg.

Tumupasa, 430 meters, Jan. 8, 1902, on old log (1954). Apolo, 1500 meters, June 28, 1902, in wet places on earth (1950). Charopampa, Rio Mapiri, 460 meters, Sept. 23, 1901, on log (1956).

CALLICOSTELLA SCABRIUSCULA (C. M.) Jaeg.

Tumupasa, 430 meters, on damp sand and roots of trees, Jan. 20, 1902 (2063).

CALLICOSTELLA MICROCARPA (Hornsch.) Jaeg.

Near Aten, 912 meters, on wet rock, June 18, 1902 (1951).

HOOKERIOPSIS VARIABILIS (Hornsch.) Jaeg.

Tumupasa, 430 meters, on wet, overhanging rock wall, Dec. 12, 1901 (2096).

Hookeriopsis longiseta sp. nov.

Autoicous: in low, loosely spreading mats, with lax stems and irregular branches about 1 cm. long and 2 mm. broad when moist; leaves when dry, spreading flexuous, more or less complanate, ovate-lanceolate, the lateral a little larger, about 1.3 mm. long and 0.5 mm. wide, without border, serrulate two thirds down; costa double, the bases separated by width of 2 or 3 cells, the two parts somewhat diverging upward, serrate on the back and vanishing above the middle, the apices ending in short spines; leaf-cells quite uniform throughout; the median about 40 μ long by 6 μ wide; perichaetial leaves erect-flexuous, ecostate, the inner mostly a little longer than stem-leaves, from an ovate base gradually narrowing to a long-lanceolate apex or sometimes to a short, nearly entire blunt apex; pedicel smooth, up to 2 cm. high; capsule short oblong, more or less horizontal, 0.75 mm. long, with erect, short-beaked lid a little shorter, when dry curved and contracted below the mouth; outer teeth of peristome furrowed and hyaline along the middle, finely cross-striate below, papillose at apex, inner segments papillose, scarcely or not split along the keel, a little shorter than the teeth; calyptra smooth, lacerate at base; spores smooth, 12 μ in diameter.

Trail between San José and Apolo, Feb. 12, 1902, 1350 meters (2042). This species is near *planiuscula* and *cirrhosa*. From the first it differs in its rather narrower leaves, longer seta, different capsule and perichaetial leaves; from the second in capsule not strumose, leaves not hamate at apex of stem and seta longer.

HOOKERIOPSIS ASPRELLA (Hampe) Broth.

Santa Anna near Aten, 1670 meters, on rock, July 31, 1902 (1953).

HOOKERIOPSIS CRISPA (C. M.) Jaeg.

Santa Anna, 1670 meters, on rock along stream, July 30, 1902 (1964). Trail between San José and Apolo, Feb. 12, 1902 (2943). Santa Cruz, 1525 meters, Aug. 25, 1902 (2944).

HOOKERIOPSIS UNDATULA (C. M.) Broth.

Mouth Rio Pelichuco, 950 meters, April 27, 1902 (2758).

HOOKERIOPSIS INCURVA (Hook. et Grev.) Broth.

Santa Barbara, Apolo region, 1650 meters, Aug. 30, 1902, on decaying log (1963). Rio Cocos, 1050 meters, on log, April 2, 1902 (1962). Trail between San José and Apolo, Feb. 9, 1902 (1961).

Stenodictyon saxicola sp. nov.

Apparently dioicous, no antheridia found: fertile flowers abundant with 50 or more archegonia and numerous longer paraphyses; plants in thin mats with creeping stems and more or less procumbent branches with complanate leaves, about 1 mm. wide; leaves when dry erect-spreading, scarcely changed by moisture, oblong-lanceolate, up to 1.25 mm. long by 0.25 mm. wide, concave, borders flat, serrulate one half down, faintly bicostate to below the middle or with the forks of costa extending about two thirds up and serrulate on the back with apices prominent; perichaetial leaves erect, above gradually narrowed to long-lanceolate, serrulate apex, more or less costate below, or the inner leaves ecostate; seta very rough, 1.5 cm. high; capsule nodding or horizontal, about 1.25 mm. long with erect-beaked lid nearly 1 mm. long, when dry and empty much contracted under the mouth; teeth of outer peristome papillose above, furrowed along the middle in lower two thirds, with outer plates finely cross-striate and prominent lamellae projecting well beyond (12 μ) outer edges of teeth; segments of inner peristome pale yellow, papillose, with narrow slits along keel, from a high basilar membrane without cilia; calyptra somewhat rough at apex and lacerate below; smooth spores 12 μ in diameter.

Trail between Aten and Apolo, 1800 meters, on rock, Aug. 6, 1902 (2081). This species is distinguished from *nitidum* at once by its much smaller size, the branches of *nitidum* being 2 to 2.5 mm. across.

LEPIDOPILUM INTERMEDIUM (C. M.) Mitt.

Santa Cruz, Aug. 25, 1902, on trees, 1600 meters (2002).

LEPIDOPILUM ANGUSTIFRONS Hampe.

Santa Barbara, Apolo region, Aug. 30, 1902, 1700 meters (2879).

The arrangement according to Brotherus in Engler and Prantl stops with this number, as that publication does not go farther at this time of writing.

HYPOPTERYGIUM TAMARISCI (Sw.) Brid.

Middle Mapiri River, 950 meters, June 13, 1902 (2947). San José to Apolo trail, Feb. 8, 1902 (1990).

RHACOPILUM TOMENTOSUM (Hedw.) Mitt.

Rio Machariapo, Apolo region, 1100 meters, April 8, 1902 (1876). Tumupasa, 430 meters, Jan. 15, 1902 (1877). Apolo, 1500 meters, June 27, 1902 (1878). Isapuri, Mapiri River, on rock, 450 meters, Oct. 3, 1901 (1879).

RHEGMATODON SCHLOTHEIMIOIDES Spruce.

Below Pelichuco, 3000 meters, on rock, April 30, 1902 (2851).

LESKEA PLUMARIA Mitt.

Sorata, on branches of trees, 2450 meters, Sept. 3, 1901 (2019).

PSEUDOLESKEA ANDINA Sch.

Tacacoma, 3100 meters, June 10, 1902 (2018).

THUIDIUM PUSILLUM Mitt.

Near Aten, 1400 meters, on log, Aug. 4, 1902 (2945). This species is near *T. minutulum* but has leaf-cells more pellucid and acutely mamillose, not with two or three small papillae to each cell surface.

THUIDIUM LEPTOCLADUM (Tayl.) Mitt.

Below Pelichuco, 2700 meters, April 30, 1902 (2779).

THUIDIUM SCABROSULUM Mitt.

Tumupasa, on bark, 430 meters, Jan. 6, 1902 (2006).

THUIDIUM INVOLVENS (Hedw.) Mitt.

Tumupasa, 430 meters, at base of tree, Jan. 19, 1902 (2062).

THUIDIUM SCHISTOCALYX (C. M.) Mitt.

Guani Rio, Apolo region, 1050 meters, on rock, Aug. 11, 1902 (2007).

THUIDIUM MINUTULUM (Hedw.) Mitt.

Near Apolo, 1500 meters, on earth of dry, shady hillside, July 24, 1902 (2008). Apolo, on rock, March 6, 1902 (2009). *T. pauperum* (C. M.) Mitt. is evidently not distinct from *minutulum*.

THUIDIUM BRASILIENSE Mitt.

Rio Pelichuco, 2100 meters, on log, April 27, 1902 (2778). Near Aten, 1700 meters, June 18, 1902, on the ground (2005). Near Aten, Aug. 16, 1902, on rock (2953). These specimens do not seem to differ in any way from the type specimens, but Mitten's description is evidently incorrect (Jour. Linn. Soc. **12**: 579) for the type shows the majority of the cells not or scarcely elongated and highly mamillose, with the apex of the cells in leaf below divided into two or three points and becoming often spine-like in upper leaf on back. I am unable to distinguish *T. Antillarum* Besch and *T. pseudorecognitum* Hpe. from above. The Bolivian specimens are similar to those of J. Weir, no. 376, near Pacho, Andes Bogotensis, which are called *delicatulum*, but they all differ from the latter in having smaller leaves on the branchlets, the paraphyllia rougher with more or less spine-like papillae and mostly with rather narrower cells toward the base of the stem-leaves. It would seem that true *delicatulum* does not occur in South America.

THUIDIUM FIRMULUM C. M.

Machariapo Rio, 1100 meters, April 8, 1902 (2015).

RIGODIUM LEPTODENDRON C. M.

Apolo, on rocks, 1500 meters, July 7, 1902 (2012).

Potamium longisetum sp. nov.

Autoicous: in loose, dark-green tufts about 4 cm. high, attached to rocks in flowing water; primary stems creeping, mostly denuded of leaves; secondary stems erect, simple or with few branches, about 3 mm. wide, with the complanate leaves spreading, either wet or dry; leaves ovate to short oblong-lanceolate, acute, 2 mm. long by 0.8 mm. wide, shortly bicostate, very concave, entire, somewhat reflexed on borders; leaf-cells toward apex narrowly rhomboidal to hexagonal, below narrow and elongate, up to 5 μ wide and 50 μ long, 5 or 6 cells in basal angles enlarged and colored with somewhat yellowish, thick-walled cells extending across leaf-base; perichaetial leaves a little smaller and narrower pointed than stem leaves, ecostate with apex sometimes slightly serrulate; seta smooth, up to 2 cm. high; capsule ovate, more or less nodding and curved, about 1.25 mm. long without lid, with a convex, slender-beaked lid .75 mm. long; exothecal cells about 20 μ wide, mostly scarcely elongate, with walls much thickened at the angles; stomata in about 2 rows near base of capsule; teeth of outer peristome brown with distinct medium line, finely cross-striate below and papillose near apex; segments of inner peristome papillose, narrow, scarcely split along the keel, as long as the teeth, with mostly single cilia between, from a basilar membrane one fourth the height of teeth; minutely roughened spores up to 20 μ.

Apolo, 1500 meters, July 10, 1902 (2115).

PTEROGONIELLA PULCHELLA (Hook.) Sch. MS. in Jaeg.

Tumupasa, 430 meters, Jan. 23, 1902 (2059). Often growing mixed with other species. The plant called *Meiothecium nanum* Besch. is evidently this species as well as *Potamium Casiquiarense* Spruce.

It seems that Schimper proposed (in MS. only) the genus *Pterogoniella* for *Pterogonium pulchellum* Hook., Musci Exot. t. 4, 1818. Jaeger was the first to publish *Pterogoniella*, in about 1875, and he put into it, first, *Sauloma*, a group of mosses not only very distinct as a genus from Schimper's *Pterogoniella*, but belonging to a different family, true *Sauloma* being quite unknown from America, although attributed to the West Indies by Carl Müller through mistaken determinations; second, *Neckera* C. M. in part; third, *Pterigynandrum* and *Pterogonium* of Montagne; fourth, *Meiothecium* Mitt.; fifth, *Potamium* Mitt.; sixth, *Pterogoniella* Sch. At present these first five genera are well recognized and quite distinct groups from the sixth, and if we continue to use Schimper's *Pterogoniella* it should evidently include only three names as above given, out of the thirty-three names included by Jaeger in his genus. Thus limited, the genus would contain those species that have a single peristome of thick, brownish teeth, densely papillose on both sides, leaves smooth, ecostate or faintly bicostate and leaf-cells at basal angles hyaline and square to short-rectangular, never yellow and inflated.

MEIOTHECIUM COMMUTATUM (C. M.).

Tumupasa, 430 meters, on tree trunk, Jan. 14, 1902 (2946).

MEIOTHECIUM TENERUM Mitt.

Apolo, 1500 meters, Feb. 26, 1902, on tree (2069).

TRICHOSTELIUM FLUVIALE (Mitt.) Jaeg.

Tumupasa, 430 meters, on decayed log, Jan. 8, 1902 (2073).

TRICHOSTELIUM AMBIGUUM (Schwaegr.) Par.

Tumupasa, 430 meters, on decayed log, Jan. 8, 1902 (2061).

TRICHOSTELIUM ARRECTUM (Mitt.) Jaeg.

Santa Barbara, near Apolo, 1700 meters, on limbs of trees, Aug. 30, 1902 (2881).

TAXITHELIUM PSEUDO-ACUMINATULUM C. M.

Tumupasa, 430 meters, on damp sand with *Fissidens* and *Ectropothecium* Jan. 17, 1902 (2896).

TAXITHELIUM PLANUM (Brid.) Mitt.

Isapuri, 450 meters, on decayed wood, Oct. 5, 1901 (2040). Isapuri, on wood and rock, Oct. 3, 1901 (2038). Tumupasa, on bark, Jan. 4, 1902 (2039).

SEMATOPHYLLUM PUNGENS (Sw.) Mitt.

Tumupasa, 430 meters, on decayed log, Dec. 12, 1901 (2124). Santa Anna, near Aten, on tree trunk, July 30, 1902 (2125).

SEMATOPHYLLUM ULICINUM Mitt.

Santa Barbara, 1700 meters, on limbs of trees, Aug. 30, 1902 (2123).

SEMATOPHYLLUM CAESPITOSUM (Sw.) Mitt.

Isapuri, 450 meters, on branches of trees, Oct. 3, 1901 (2113).

SEMATOPHYLLUM LOXENSE (Hook.) Mitt.

Near Pelichuco, 3000 meters, on rock, April 30, 1902 (2749). Apolo, 1500 meters, at base of trees, Feb. 21, 1902 (2110). Apolo, on rock in stream, April 17, 1902 (2112).

Apolo, on wet rock, July 13, 1902 (2118). Near Aten, 1700 meters, on rock, Aug. 16, 1902 (2082). Consata, 1200 meters, on rock, June 12, 1902 (2119).

SEMATOPHYLLUM GALIPENSE (C. M.) Mitt.

San José to Apolo trail, Feb. 12, 1902, on rock (2105). Near San José, 515 meters, on rock, Jan. 31, 1902 (2104), Tumupasa, 430 meters, on rock, Jan. 10, 1902 (2098). Tumupasa, on rock, Jan. 4, 1902 (2114). Apolo, on rock, 1500 meters, Feb. 14, 1902 (2106). Tumupasa, on rock, Dec. 8, 1901 (2075).

SEMATOPHYLLUM CUCULATIFOLIUM (Hampe) Mitt.

Lower Rio Cocos, 900 meters, March 25, 1902 (2101). Near Aten, 1100 meters, on wet rock, July 26, 1902 (2117). Apolo, 1500 meters, on tree, March 1, 1902 (2111).

Sematophyllum tenuicarpum sp. nov.

Monoicous: forming low, yellowish-green mats with creeping stems and rather short, more or less erect and curved branches; leaves somewhat spreading all around stem, either wet or dry; stem-leaves ovate-lanceolate, entire, somewhat recurved on the margin, 1.3 mm. long, with cells mostly narrowly linear, but becoming more or less rhomboidal in the apex and with 4 or 5 large, yellow, inflated cells at basal angles; terminal branch-leaves a little shorter than stem-leaves with broader and minutely serrulate apex; inner perichaetial leaves as long as stem-leaves, lanceolate, entire or minutely serrulate at the apex; seta 1 cm. high; capsule nearly straight and erect, cylindrical-oblong, without lid, 1 mm. high by .25 mm. in diameter, with a slender beaked lid about .75 mm. or more in length; exothecal cells with rather thin, somewhat sinuous walls, not greatly thickened at the angles and somewhat irregularly thickened at the sides, near middle of capsule about 15 μ wide by 28 μ long; peristome double, outer teeth pale, finely papillose with rather broad apex and hyaline border; inner segments narrow, solid, papillose, slightly exceeding the teeth in length, with short or no cilia between; smooth spores up to 17 μ in diameter.

Tumupasa, 430 meters, on bark, Dec. 11, 1901 (2066). This species is somewhat like both *S. chrysostegum* and *agnatum*, but *chrysostegum* has a much longer pointed leaf and broader capsule; *agnatum* has a longer pointed leaf and broader capsule, with exothecal cells nearly square and walls greatly thickened at the angles.

SEMATOPHYLLUM CHRYSOSTEGUM (C. M.) Mitt.

Sorata, 2450 meters, on trees, June 3, 1902 (2024).

SEMATOPHYLLUM CIRCINALE (Hampe) Mitt.

Near Aten, 1400 meters, on tree, July 27, 1902 (2023). Achiquiri, 950 meters, on decayed log, June 17, 1902 (2948). Apolo, 1500 meters, at base of tree, Feb. 24, 1902 (2132). Tumupasa, 430 meters, Jan. 29, 1902, on tree (2060).

SEMATOPHYLLUM OBLIQUIROSTRATUM Mitt.

San José to Apolo trail, 1400 meters, Feb. 10, 1902 (2108).

SEMATOPHYLLUM PROMINULUM Mitt.

San Juan, 960 meters, on rocks, March 21, 1902 (2025). The leaves of these specimens seem to be quite smooth on the back as is evidently the case with the type specimen in the Mitten herbarium.

SEMATOPHYLLUM SUBSIMPLEX (Hedw.) Mitt.

Tumupasa, 430 meters, at base of tree, Jan. 19, 1902 (2079). Tumupasa, on decayed log, Jan. 14, 1902 (2084). Between Rio Cocos and Rio Lanca, March 26, 1902 (2026). Between Ixiamas and Tumupasa, Dec. 20, 1901 (2076). Achiquiri, near Mapiri, 1000 meters, on decayed log, June 17, 1902 (2027). This species is of a rather pale green color; the exothecal cells are somewhat mamillose, hexagonal, with walls not thickened.

MICROTHAMNIUM THELISTEGUM (C. M.) Mitt.

Apolo, 1500 meters, on earth and rock, March 9, 1902 (2030). Tumupasa, 430 meters, on decayed log, Jan. 8, 1902 (2031). Between Tumupasa and San José, Jan. 30, 1902 (2034). Rio Tuichi, on decayed wood, April 7, 1902 (2036).

MICROTHAMNIUM ELEGANTULUM (Hook.) Mitt.

Near Aten, on log, 1150 meters, July 27, 1902 (2054).

Near Apolo, 1800 meters, on log, July 24, 1902 (2053). Near Aten, 1200 meters, on rock, Aug. 4, 1902 (2055).

MICROTHAMNIUM OXYSTEGUM Spruce.

San José to Apolo trail, on rock along stream, 925 meters, Feb. 5, 1902 (2037).

MICROTHAMNIUM ANDICOLA (Hook.) Mitt.

Apolo, 1500 meters, on bark of tree, July 7, 1902 (2032). Near Aten, on decayed log, June 19, 1902 (2090). San José to Apolo trail, Feb. 7, 1902 (2033). These specimens seem to be the same species as those of Weir, no. 279, Pacho, 6500 ft., Andes Bogotense. The stem-leaves are about twice wider than any figures given by Hooker for this species in Musci Exot. Tab. 83.

MICROTHAMNIUM REPTANS (Sw.) Mitt.

Santa Cruz, 1525 meters, Aug. 24, 1902 (2045). Santa Barbara, on rock along stream, Aug. 29, 1902 (2011). Tumupasa, 430 meters, on rock, Jan. 10, 1902 (2046). Consata, 1220 meters, June 12, 1902 (2047). The following species is possibly scarcely distinct in having narrower, more gradually pointed stem-leaves.

MICROTHAMNIUM LANGSDORFFII (Hook.) Mitt.

Between Apolo and Aten, 1600 meters, on old logs, Aug. 6, 1902 (2087). San José to Apolo trail, on bark, Feb. 12, 1902 (2950). Apolo, on damp, shady ground, April 17, 1902 (2043). Ipurima, between San José and Apolo, Feb. 7, 1902 (2949). Lower Rio Cocos, 925 meters, on bark, April 1, 1902 (2044). *M. acrorrhizon* (Hornsch.) Jaeg. evidently belongs under this species. Also *M. pendulinum* (Hampe) Jaeg.

ECTROPOTHECIUM AERUGINOSUM (C. M.) Mitt.

Consata, 1220 meters, June 12, 1902 (2051). Near Aten, 1100 meters, on wet sand by stream, July 27, 1902 (2052).

ECTROPOTHECIUM VESCICULARE (Schwaegr.) Mitt.

San Juan, Rio Asariamas, 1160 meters, on log, March 22, 1902 (2028). San Buena Ventura, 190 meters, on rock along stream, Nov. 15, 1901 (2029). Santa Barbara, 1670 meters, on rock, Aug. 30, 1902 (2050).

ECTROPOTHECIUM AMPHIBOLUM Spruce.

Near Aten, 1070 meters, on decayed log, Aug. 4, 1902 (2049). Near Aten, on wet clay, Aug. 3, 1902 (2058). San Juan, Rio Asariamas, 1160 meters, March 22, 1902 (2032).

ISOPTERYGIUM BRACHYNEURON (C. M.) Mitt.

Charopampa, 480 meters, on bark, Sept. 24, 1901 (2056). Tumupasa, 430 meters, Jan 25, 1902 (2131). New Brazil, June 15, 1902, on bark (2094). Near Aten, on decayed wood and earth, 1500 meters, June 17, 1902 (2070). Apolo, on decayed wood and earth, 1500 meters, June 29, 1902 (2091).

ISOPTERYGIUM TENERUM (Sw.) Mitt.

San Buena Ventura, 190 meters, on bark, Nov. 29, 1901 (2095). Tumupasa, 430 meters, on bark, with *Pterogoniella pulchella*, Jan. 23, 1902 (2059).

ISOPTERYGIUM LEUCOPHYLLUM (Hampe) Mitt.

Apolo, 1500 meters, on tree trunk, March 6, 1902 (2068). Near Apolo, on tree trunk, Feb. 14, 1902 (2071).

Plagiothecum mollicaule sp. nov.

Apparently dioicous: plants in glossy, light-green, soft mats with procumbent, slender, scarcely branching stems up to 5 cm. long or more and 175 μ in diameter, without central strand and a rind of one row of smaller, thin-walled cells; leaves complanate, slightly curved to one side, entire, long-decurrent, about 1.25 mm. long and .5 mm. wide, broadly ovate-acute with a short-subulate, entire apex, more or less recurved on borders, ecostate or bicostate up to one third of leaf, with an ill-defined cluster of larger, pale cells at the basal angles; median leaf-cells about 6 μ wide and up to 80 μ long; perichaetial leaves from a broad base gradually lanceolate-pointed, ecostate, entire, convolute with the apex mostly spreading; seta about 1.5 cm. high; capsule erect or nodding, oblong, without lid about 1 mm. long, exothecal cells near middle of capsule up to 24 μ wide and 30 μ long, about 3 rows of cells at mouth transversely elongate; lid conical apiculate, annulus simple, breaking away in fragments; peristome teeth pale, striate below, papillose above, about 50 μ wide at base and 320 μ high; inner segments of equal length, very narrow, solid or slightly split along keel, slightly papillose, with or without more or less elongated solitary cilia between, from a basilar membrane extending above mouth one fourth height of teeth; spores not quite smooth, up to 12 μ in in diameter.

Near Pelichuco, 2450 meters, on damp rock, April 30, 1902 (2780). This species is somewhat like *P. laeviusculum* C. M., but rather larger and leaves long-decurrent.

Rhynchostegium alboviridum sp. nov.

Monoicous: plants in low, rather compact pale-green mats; stems short, with few branches and leaves mostly destroyed by maceration; branch-leaves complanate, rather crowded, up to 1.25 mm. in length, broadly ovate to rotundate, concave, borders flat above, recurved below, serrulate to below the middle, rather abruptly short-pointed or with a longer twisted point; costa sometimes indistinct, not prominent on the back, mostly vanishing near or below middle of leaf; leaf-cells prosenchymatous, the median 7–8 μ wide and up to 80 μ long, the basal much shorter and broader, not forming distinct clusters at angles; perichaetial leaves ecostate or faintly costate, from a broadly ovate base gradually narrowed to a lanceolate, entire or minutely serrulate nearly erect point, about one half the length of wider part of leaf; seta smooth, up to 20 mm. high; capsule short, scarcely over 1 mm. long without lid, more or less horizontal, curved, when dry and empty much contracted below the mouth, with a convex, obliquely rostrate lid and broad annulus mostly adhering to capsule; teeth of peristome one half mm. high by one tenth mm. wide at base; inner segments, from a high membrane, broad, split along keel, with 2 or 3 cilia between, sometimes nearly as high; nearly smooth spores up to 12 μ.

Apolo, 1500 meters, on clayey soil, March 10, 1902 (2109). This species is near *R. campylocarpum* but the leaves are broader and shorter with shorter costa.

RHYNCHOSTEGIUM CALLISTOMUM Besch.

Apolo, 1500 meters, on earth, June 28, 1902 (2089). These specimens have a distinct annulus, mostly adherent to the capsule, as do specimens of the type collection, no. 2763, Bourgeau, although the species is described as without annulus. I am inclined to believe the species is not distinct from *Huitomalconum*, but have not seen good specimens of the latter for comparison.

RHYNCHOSTEGIUM LAMASICUM (Spruce) Jaeg.

San Juan, 1160 meters, on decayed log, April 4, 1902 (2103).

Distinguished by the broad apex of the leaves.

RHYNCHOSTEGIUM PLANIFOLIUM C. M.

Apolo, 1500 meters, on damp ground in shade, July 10, 1902 (2093). This seems to be near *H. pallidius* Hampe from Rio Janeiro, Glaziou, no. 7131, but perhaps the leaf-cells below average a little narrower and the leaf apex seems rather more acutely pointed.

RHYNCHOSTEGIUM AQUATICUM (Hampe) Jaeg.

Sorata, 2400 meters, on rock in spray of waterfall, June 6, 1902 (2020). Near Pelichuco, 2700 meters, on submerged rock, April 30, 1902 (2776). *R. Limnobiella* C. M. I am unable to distinguish in any way from *aquaticum.*

EURHYNCHIUM EXASPERATUM (Hampe) Jaeg.

Sorata, 2400 meters, on submerged rock, Aug. 31, 1902 (2130).

BRACHYTHECIUM STEREOPOMA Spruce.

Santa Barbara, 1700 meters, on shaded ground, Aug. 24, 1902 (1976). Apolo, 1500 meters, on ground, July 9, 1902 (1977).

BRACHYTHECIUM TENUIPINNATUM (C. M.) Par.

Rio Pelichuco, 2600 meters, on rock, April 28, 1902 (2777).

BRACHYTHECIUM BOLIVIO-PLUMOSUM C. M.

Near Pelichuco, 2700 meters, on rock, April 30, 1902 (2783).

HARPIDIUM ADUNCUM INTERMEDIUM Schimp.

Yura, Peru, 2400 meters, immersed in small stream, Aug. 11, 1901 (2786). No. 2787, growing near the preceding, seems to be a more compact form of the same variety.

Hygrohypnum Pelichucense sp. nov.

Dioicous: growing in low, compact, mostly brownish mats; primary stems creeping, stiff and wiry, with branches up to 3 cm. long, bearing rather distant, irregular, curved branchlets; cross-sections of stem about 175 μ in diameter, without central strand or outer rind, the rind composed of about 4 rows of small thick-walled cells; leaves mostly homomallous, simply costate to near middle or costa shorter and unequally forking; the stem-leaves short ovate-lanceolate, about .8 mm. long and .4 mm. wide, very concave, serrulate above, with a scarcely distinct cluster of cells at basal angles; branch leaves much narrower than stem-leaves and gradually smaller toward the apex of branch; leaf-cells from elongate-hexagonal above to more or less linear below, the median about 7 μ wide and 20–36 μ long; perichaetial leaves gradually narrowed to a long, slender, flexuous, slightly serrulate apex; seta about 18 mm. long; capsule from nodding to mostly horizontal, oblong, with the obtuse, mamillate lid 1.6 mm. long, the scattered stomata near base nearly round, about 28 μ in diameter; annulus two rows of cells high; teeth of peristome pale brown, with outer plates rather indistinct and finely papillate-striate, the segments of endostome nearly as long as teeth with narrow perforations along keel and with one to three shorter cilia between, from a basilar membrane extending above mouth two fifths the height of teeth; smooth spores up to 16 μ.

Pelichuco, 3300 meters, on rock, April 29, 1902 (2781).

Calliergon Luipichense sp. nov.

Plants sterile, in deep blackish tufts in water; stems somewhat branching, 15 cm. or more high, with quite regularly pinnate, rather close branchlets with cuspidate apex, mostly under 1 cm. long; leaves, more or less suffused with red, mostly destroyed by maceration on stem below, above closely imbricate, narrowly decurrent, about 2.5 mm. long and 0.8 mm. wide, ovate-lanceolate, broadest about one fourth up from base, slightly serrulate at the often recurved, short-cuspidate apex, strongly costate to a little below the apex; leaf-cells narrowly linear, the median about 5 μ wide and 80 μ long, with lateral walls thickened and more or less pitted, at basal angles enlarged and hyaline or reddish, forming a distinct cluster.

Growing in a small pond at 4300 meters elevation near the Luipichi Pass, Sept. 9, 1901 (2021). This species is perhaps nearest some of the branching forms of *C. sarmentosum*.

SCORPIDIUM SCORPIOIDES (L.) Limpr.

In pond with preceding species. The older leaves in these specimens are in poor condition but I believe there are no characters by which the plant may be distinguished specifically from North American and European specimens (2022).

I am indebted to Dr. Warnstorf for naming the following species of *Sphagnum:*

SPHAGNUM MEDIUM Limpr. v. PURPURASCENS (Russ.) Warns. forma ANOCLADA.

Below Tolapampa, 2430 meters, Sept. 12, 1901 (1686).

SPHAGNUM MEDIUM Limpr. v. VIRESCENS Warns.

Near Apolo, 1828 meters, on sand along stream, July 25, 1902 (1693).

SPHAGNUM MEDIUM Limpr. v. PALLESCENS Warns. f. DENSA.

Near Ingenio, 3050 meters, Sept. 10, 1902 (1687).

SPHAGNUM MERIDENSE C. M. v. PATULUM Warns.

Below Tolapampa, 2430 meters, Sept. 12, 1901 (1692).

SPHAGNUM BOLIVIAE Warns. sp. nov. v. VIRESCENS Warns.

Tumupasa, 550 meters, Dec. 12, 1901 (1691.) Near Yuyu, 912 meters, June 18, 1902 (1690).

SPHAGNUM BOLIVIAE Warns. v. VIRESCENS Warns. f. BRACHYANOCLADA.

Apolo, 1500 meters, June 27, 1902 (1689).

This *Grimmia* was omitted from its proper place in Part I.

Grimmia julacea sp. nov.

Autoicous, ♂ flowers with inner perigonial leaves short-ovate, acute, very concave, ecostate, enclosing 7 or 8 antheridia about 80 μ high, without paraphyses: plants in dense, hemispherical, grayish-green tufts with mostly dichotomously branching stems up to 1.5 cm. high; cross-section of branch about 200 μ in diameter with well-defined central strand about 50μ in diameter and rind of 2 rows of somewhat thicker-walled cells; branch-leaves closely and regularly imbricate, either wet or dry, about 1 mm. long, rotundate or broadly ovate, concave, entire, rather gradually tapering into a hyaline, lanceolate, serrulate apex, papillose on its inner face, in cross-section showing a single layer of cells in leaf-blade and margin, with costa on ventral side composed of 3 or 4 large cells, on dorsal side of 4–6 cells, and between, a band of small, thick-walled cells up to 8 or 10 in number; costa mostly vanishing at base of hyaline apex; leaf-cells in lower one half of leaf mostly square, up to 16 × 16 μ, with thin walls and either hyaline or green, above to the hyaline apex green, somewhat elongate, with slightly thickened and rarely sinuous walls; perichaetial leaves larger than lower leaves with longer more serrulate point and costa above hyaline and more or less percurrent; fruit very immature, apparently immersed on a short straight seta, calyptra short-mitrate, smooth, lacerated at base.

Arequipa, Peru, 2400 meters, on dry, exposed rock, Aug. 8, 1901 (2805); sterile stems of this species have much the appearance of some *Plagiobryum* but they are green, not red, and the hyaline apex is more or less papillose.

CORRECTIONS.

In Part I of this enumeration, Bull. N. Y. Bot. Garden 3 (9): 107. 1903, the following corrections should be made.

No. 1756, *Campylopodium sulcatum* n. sp., is *Campylopus* (*Pseudocampylopus*) *Krauseanus* (Hpe. et Lor.) Par.

No. 1748, *Campylopus concolor* (Hook.) Mitt, is evidently not that species but *C. rosulatus* (Hpe.) Mitt.

No. 1759, *Campylopus porphyreodictyon* (C. M.) Mitt., is rather *C. filifolius* (Hornsch.) Mit.

No. 1741, *Dicranella subserrulata* n. sp., equals *D. Hilariana* (Mont.) Mitt.

Critical Notes on New or Little Known Species in the Herbarium of the New York Botanical Garden

By B. P. G. Hochreutiner

Poaceae

Centotheca lappacea (L.) Desv. Nouv. Bull. Soc. Philom. 2: 189. 1810

Cenchrus lappaceus L. Sp. Pl. ed. 2. 1488. 1763.

Hooker (Fl. Brit. Ind.) identifies that plant with *Poa malabarica* L. Sp. Pl. 69 (1753), which is a prior name and should be kept in the new genus. But we find that our plant, with its dense panicle, and leaves 1.5–1.8 cm. wide, is very distinct from the *Poa malabarica* of the Linnaean Herbarium. The Linnaean plant shows a very poor and lax panicle, and leaves 5–6 mm. wide. On the contrary, our specimen is identical with the *Cenchrus lappaceus* which is to be found in Linnaeus' collection. Therefore the binomial created by Desveaux must be considered as the right one.

Apocopis paleacea (Trin.) Hochr. comb. nov.

Ischaemum paleaceum Trin. Mem. Acad. Petersb. VI. **2**: 293. 1833; Sp. Gram. Ic. *t. 333*.

Apocopis Royleana Nees, Ann. Mag. Nat. Hist. **7**: 220. 1841; Hook. f. Fl. Brit. Ind. **7**^{1}: 142.

Andropogon paleaceus et *himalayensis* Steud. Syn. Gram. **1**: 376. Nepalia (*Wallich no. 8843*) in Herb. N. Y. Bot. Gard.

That specimen is identical with *Royle no. 357*, *i. e.*, the type of *A. Royleana* and with specimens from Nepaul, the original locality of Trinius for *T. paleaceum*. Therefore, the synonymy being certain, the oldest name, *paleaceum*, must be taken up.

Andropogon (§ **Vetiveria**) **zizanioides** (L.) Hochr. comb. nov.

Phalaris zizanioides L. Mant. 183. 1771.

Andropogon squarrosus L. f. Supp. 433. 1781; Hook. f. Fl. Brit. Ind. **7**: 186; Hack. in DC. Mon. Phan. **6**: 542.

A. muricatus Retz. Obs. **3**: 43. 1779; **5**: 21. 1791.

Anatherum muricatum Beauv. Agrost. 150. 1812.

Vetiveria muricata Griseb. Fl. Brit. W. Ind. 559. 1859–64.

Indiae Or. (*Ward no. 38*) in Herb. N. Y. Bot. Gard.

A more complete synonymy may be found in Hook. Fl. Brit. Ind. *loc. cit.* — The older names only are given here, in order to show that the one which has priority is *A. zizanioides* (L.).

CYPERACEAE

SCLERIA LAEVIS Retz. Obs. 4: 13; Miq. Fl. Ind. Bat. 3: 141

After seeing the original of Miquel, we can state that even this type specimen has the teeth of the disk sometimes a little dentate. This is in opposition to the description of Miquel and we believe that it is an error of this author who has seen only entire teeth. There is no doubt about the naming, and Mr. Clarke also ascertained the determination of Miquel.

BROMELIACEAE

PITCAIRNIA MEGASEPALA Baker, Journ. Bot. 19: 229. 1881 · Mez, in DC. Mon. 9: 402, *pro parte*.

Nova Grenada, La Paila (*Holton* 21, III, 1853, *no. 153*) in Herb. N. Y. Bot. Gard. and Kew.

This being the first number quoted by Baker it must be considered as the type. Compared with the type of *P. araneosa* Baker it is distinctly different. But there is an analogy between the two species. Therefore it happened that Baker himself named *megasepala* a specimen of *Kalbreyer no. 661* which is *P. araneosa* without any doubt. That error induced Mez, who saw the Kew specimens, to identify *P. araneosa* and *P. megasepala*, and he wrote on the sheet of *Kalbreyer no. 661*, " hanc a *P. araneosa* discernere nequeo." He was right, because, in spite of the name *megasepala*, written by Baker, it was *P. araneosa* itself. These circumstances show the importance of pointing out clearly *what is the type!*

The first plant quoted by Baker in his original description of *P. megasepala* is *Holton no. 153*, and the first quoted for *P. araneosa* is *Schlim no. 139*. Therefore they must be considered as types. If so, there is no difficulty at all, because they are perfectly distinct. Mez never confused them, if he took the types alone into consideration. But he also admitted as a type the Kalbreyer specimen named by Baker later on and by error, *P. megasepala*. That plant being *P. araneosa* Mez could not but unite it with *P. araneosa*.

Having the types of both *P. araneosa* and *megasepala* in my hands, I will give a short account of their differential characters:

P. MEGASEPALA	P. ARANEOSA
Inflorescence simple.	Inflorescence ramose.
Inferior part of shaft glabrous, superior part as well as bracts minutely puberulous with a rather brownish color.	Shaft, pedicels, bracts and calyx covered with a whitish, dense arachnoid tomentum.
Bracts bearing flowers 2.5 × 0.5–3.5 × 1 cm. long and wide at base; bracts of the terminal bud 1.5 × 0.4 cm. long and wide.	Bracts bearing flowers 1.5 × 0.2–3.5 × 0.6 cm. long and wide at base; bracts of the terminal bud almost indistinguishable on account of the pubescence, 1 × 0.25 cm. long and wide.
Calyx-lobes 4 × 0.3 cm. long and wide, brownish with a scattered brownish pubescence.	Calyx-lobes 3–3.2 cm. long by 0.2–0.25 cm. wide at base, dark, nearly black colored, with a white pubescence.
Petals about 5.5 cm. long.	Petals 4.5–5 cm. long.
When the flowers open the calyx spreads.	When the flowers open the calyx remains tightly closed and the petals must force their way between the sepals.

LILIACEAE

Scilla Griffithii Hochr. sp. nov.

Bulbi ovati, tunica scariosa ± argentea pallida. Folia linearia, elongata, longe attenuata, acuta, basi vaginantia et scapi longitudinem superantia. Racemus 9–15-florus; bracteae minimae scariosae; pedicelli longi, ± erecti, ut scapus glaberrimi; perigonii phylla uninervia, elliptico-linearia, subacuta; stamina phyllis paulo breviora, filamenta basi dilatata; stylus teres, staminibus vix aequilongus; ovarium subglobosum. Capsula obovata, pyriformis.

Bulbus ca. 2.5 cm. longus, folia 16–25 cm. longa, 0.2–0.3 cm. lata. Scapus 15–20 cm. longus; pedicelli 0.5–1.2 cm. longi; petala ca. 0.9 × 0.25 cm. longa et lata; stamina ca. 0.7 cm. longa. Capsula 0.5 cm. longa et 0.6 cm. lata.

Afghanistan (*Griffith no. 5805*) in Herb. N. Y. Bot. Gard. et Kew.

This species stands close to *S. Hohenackeri*, with which it has the closest relationship; but *S. Hohenackeri* differs in having a dark bulb, a 4–7-flowered inflorescence, somewhat smaller flowers

and a round capsule. Our plant was mixed with *S. Hohenackeri* in the Kew herbarium.

AMARYLLIDACEAE

Hymenocallis longibracteata Hochr. sp. nov.
[e subgen. *Euhymenocallis* = *Hymenocallis proper* Baker Amaryll. 121. 1888]

Folia taeniaeformia, glabra, sessilia. Pedunculus foliis probabile parum brevior. Flores 3–6, in capitulum dispositi; spathae maximae, scariosae, interdum tubo corollae longiores. Tubus corollinus mediocris, laciniae tubo aequilongae, lineares, acutae. Filamenta longa, corollae fere aequilonga, basi in cupulam staminalem infundibuliforme ore ± fimbriatam, dilatata; antherae lineares, longae, tertiae vel quartae parti inferiori dorsifixae. Stylus staminibus conspicue longior, filiformis, apice capitatus.

Folium, quod vidi, ca. 45 × 1.4 cm. longum et latum. Pedunculi, quos vidi, ad 38 cm. longi. Bracteae ad 12 cm. longae et ultra. Tubus corollae 11–12 cm. longus et ultra; laciniae ad 10 cm. longae et 0.5–0.6 cm. latae. Filamenta filiformia ca. 5 cm. longa, anthera 1.5–2 cm. longa et 1–0.5 mm. lata. Cupula staminalis ca. 1.7 cm. in diam. lata et ca. 2 cm. longa. Stylus ca. 7 cm. cupulae staminalis marginem excedens.

Mexico, Orizaba (Fred. Müller, 18 Juin, 1853, sine no.), in Herb. N. Y. Bot. Gard.

This species is related to *H. lacera* Salisb. and *H. galvestonensis* Baker. It has, like both of them, linear leaves, but differs from *H. lacera* by its enormous bracts (*lacera* has small bracts) and from *H. galvestonensis* by its longer corolla-tube (*galvestonensis* has a tube 4–8 cm. long).

Bomarea Holtonii Hochr. sp. nov. (e sect. *Eubomarea*)

Caules sarmentosi, acute quadrangulares, glabri. Folia resupinata, lanceolato-oblonga, aliquantulum obtuse vel ± acute acuminata, basi attenuata, supra nitida, glaberrima, subtus ± grisea, elevato-parallelinervia, in nervis hirsuta, ceterum glabra, marginibus parum revoluta. Inflorescentia terminalis, umbellam compositam efformans; axis dilatatio, pedunculos gerens, pilosa; involucri basilaris bracteae foliis conformes, nonnullae tantam angustiores usque ad lineares. Pedunculos vidi 7; pedunculus quisque fere usque ad apicem glaberrimus, 3–4 flores et totidem bracteas ovato-lanceolatas, apiculatas, quam involucrum minores, sed non resupinatas gerens; flos quisque bracteae oppositus, pedicellatus; pedicelli bracteis breviores, praecipue apice et basi glanduloso-pilosi. Ovarium obconicum, dense glanduloso-pilosum. Tepala aequilonga; exteriora oblonga, apice ± cucullata, extus glanduloso-pilosa, intus basi papillosa et parte media et superior epidermatis plicis minimis longitudinalibus praedita, ita ut tepala minutissime et adpresse pilosa videantur; tepala interiora spatulata, i. e., basi longe unguiculata, apice lanceolato-dilatata, extus secundum lineam longitudinalem mediam glanduloso-pilosa, intus parte inferiore papillosa. Stamina tepalis circa aequilonga; antherae lateoblongae, fere circulares; filamenta filiformia; parte superiore glabra, parte inferiore papillosa. Stylus apice trifidus, basi triangularis, papillosus.

Petioli ± 0.5 cm. longi; lamina 7 × 2.4 cm. longa et lata. Involucri bracteae foliis simillimae 6 × 2–5 × 0.8 et etiam 3.5 × 0.2 cm. longae et latae; inflorescentiae rami ca. 15 cm. longi; bracteae floribus oppositae 3 × 0.8–2 × 0.5–1 × 0.4 cm. longae et latae; floris primi ordinis pedicellus 1.7–1.9 cm. longus, floris secundi ordinis pedicellus ca. 1.2 cm. longus, alabastri 3 ordinis pedicellus ca. 0.5 cm. longus. Ovarium ca. 0.4 cm. longum et apice totidem latum. Tepala exteriora ca. 1.7 × 0.7 cm. longa et lata, interiora ca. 1.6 × 0.4 cm. longa et lata. Stamina ca. 1.6 cm. longa; antherae ca. 1.5 × 1.5 mm. longae et latae.

Nova Grenada, Bogota, ultra Ceboté (leg. Holton 15 Déc. 1853, sine no.) in Herb. N. Y. Bot. Gard.

Our plant is very near *B. edulis* and *B. salsilla*, but the first has much larger flowers and a glabrous ovary, and the second has linear leaves. Following the description it must also be related to *B. Hieronymi* Pax (in Engl. Jahrb. **11**: 332) which however differs in having less numerous inflorescence-branches, a glabrous ovary and the hairs underneath the leaves *between* the nerves instead of *on* them. The angular stem is very characteristic of *B. Holtonii.*

BOMAREA PARDINA Herb. Amaryll. 115, *t. 117*, *f. 1;* Baker Amaryll. 158, var. **longepedicellata** Hochr. var. nov.

A typo differt pedicellis conspicue longioribus, 9–10 cm. longis (in typo 2–3 cm.), petalorum maculis valde minoribus, in varietate minimis, petalis latioribus, ad et ultra 2 cm. latis (in typo ca. 1.4 cm. latis).

Nova Granada, Volcancito (leg. Holton 26, I, 1853, sine no.), in Herb. N. Y. Bot. Gard.

This may be a distinct species, which might also be related to *B. conferta.* The latter differs, however, by having petals up to 5 cm. in width, pubescent stems, and lanceolate leaves which are pubescent underneath. On our plant the stem and leaves seem to be glabrous and the leaves are ovate; but the specimen is too imperfect for an accurate specific description.

VELLOZIACEAE

VELLOZIA GLAUCA Pohl Ic. et Descr. Pl. Brasil. 1 : 125, *t. 100.* VAR. GENUINA Seubert, in Mart. Fl. Brasil. 3^1: 79, *pro parte* quoad synonym, *i. e.*, = *V. glauca* Pohl sensu stricto.

Brasilia, Goyaz, dry campos, terra de natividade (*Gardner* II, 1840, *no. 4018*), in Herb. N. Y. Bot. Gard. and Kew.

At first we believed this plant to be a new species, because it has simple conical acuminate scales on the ovary, while all specimens seen in various herbariums and named *V. glauca genuina* have furcate or fimbriate scales. After examining carefully the original plate and description, one will be convinced that the plant with simple scales is the true *V. glauca*, the others being only varieties, races, or allied species of it. Very likely the plant with furcate scales has been considered as the typical variety on account of the description of Seubert in Flora Brasil. *loc. cit.* He says " capsulae tuberculis apice vix truncatis sed excurrentibus in cuspides binas vel unicam hamoso-recurvatam . . . ;" but considering the plate of the type, Pohl writes authoritatively : " squamae opacae, conico-acutae." The scales of *Gardner no. 4018* are constantly simple, conical, acute and even acuminate; therefore we believe that it is the true *V. glauca* of Pohl, and that Seubert confused the two varieties.

DIOSCOREACEAE

Dioscorea orthogoneura Uline, ined. (e sect. *Triandra* Hochr.) sp. nov.

Caulis, teres, ± striatus et spiraliter tortus, fere glaber. Folia alterna, simplices; petiolus striatus, ima basi plerumque parum contortus; lamina petiolum valde seperans, glabra, e sinu aperto cordato-triangularis, 7-nervosa, nervis tribus mediis aream anguste lanceolatam determinantibus; nervi extimi bipartiti, nervi secundarii ± transversales; nervi omnes, praecipue statu juniore, utrinque prominentes; lamina apice attenuato-acuta, minute mucronata margine integra. Inflorescentiae ♂ simplices, spiciformes, tenues, foliis multoties longiores, 1 vel 2 in foliorum axilla proeminente; rachis glaber, ± angulatus, filiformis; bracteae parvae, ovato-subulatae, scariosae; flores parvi, fere sessiles, solitarii. Perigonii tubus cylindrico-infundibuliformis, bracteas superans, extus et intus glaber; lobi 6, ovato-oblongi, juniores subacuti, seniores plane rotundati reflexi. Staminae 3, perigonii tubi medio inserta; antherae oblongae, aliquantulum exsertae, filamentibus breviores. Ovarii rudimentum parvum. In planta ♀ (*Burchell no. 8623*) capsula lutea, latior quam longa, apice umbilicata, triquetra, costis reniformibus prominentibus. Semina undique alata.

Petioli 1.2–1.7 cm. longi; lamina 3 × 2.6–3.5 × 3–6 × 4.5 cm. longa et lata. Inflorescentiae ca. 13 cm. longae; flos infimus ca. 1.6 cm. supra basin insertus; bracteae ca. 1.25 mm. longae; pedicelli ca. 0.25 mm. longi. Perigonii tubus 1.5 mm. longus; lobis ca. 0.75 mm. longis. Stamina ca. 0.75 mm. longa. Capsula 1.6 × 1.9 cm. longa et lata; semina 2.5 × 3 mm. lata et longa. Semen cum alis 5 × 4.5 mm. longum et latum.

Brasilia tropicalis, between Meiaponte et Caïsarea (*Burchell* 23 Oct. 1827, *Cat. no. 6306*) in Herb. N. Y. Bot. Gard. and Kew (*Burchell*, *Cat. no. 8623 et 8187*) in Herb. Kew.

This species finds its place in section *Allactostemon* Grisebach, next to *D. filiformis*, *fracta* and *furcata* (cf. Mart. Fl. Brasil. 3^1: 44) from which it differs by its long inflorescence, much exceeding the leaves, and by the solitary flowers. In the system of Uline (in Engl. Pfl. Fam., Nachtr.) it is easy to determine *D. orthogoneura's* place if we admit that *Burchell's no. 8623* is the female state of the same species. (The leaves and inflorescences being identical, the identification does not seem doubtful.) In that case, our plant must belong to the *Eudioscorea* with a wide capsel, alternate leaves and without stellate hairs. It means the sections 48, 49 or 50 *Stenophyllidium* to *Lasiogyne;* but all of them have 6 stamens or staminodes. The one has flowers in bundles and the other pedicellate flowers. Therefore a new section must be admitted, for which we propose the name *Triandra*, and this section should be characterized as follows:

TRIANDRA (subgen. *Eudioscorea* Pax) Capsula latior quam longa; caules dextrogyra; folia integra alternantia; planta glabra; stamina 3, perigonii tubi medio inserta; perigonii lobi subaequilongi; flores masculi solitarii, sessiles; ovarii rudimentum conspicuum.

DIOSCOREA SCHOMBURGKIANA Kunth; Schomb. Fauna und Fl. Brit. Guian. 899, nomen. 1848

Helmia Schomburgkiana Kunth, Enum. Pl. 5: 424. 1850.

Guyana Brit., Roraima (*Schomburgk* an. 1842, *no. 850*).

This is a very queer case of nomenclature. For *Helmia Schomburgkiana* Kunth there is a correct description by Kunth, but the author does not mention at all that two years before he named the plant *Dioscorea Schomburgkiana*. And, of course, when he created the binomial name *D. Schomburgkiana* he did not yet know that he would describe it as *Helmia* two years later. So it was only by accident that I discovered the two names to be synonyms. But if

Helmia Schomburgkiana is a valid name, it is not the case with *Dioscorea Schomburgkiana*, in spite of the later description of Kunth, because under *Dioscorea Schomburgkiana* there is no reference to *Helmia Schomburgkiana* (Vienna rules, art. 37). Therefore I ought to to be responsible for the new binomial *Dioscorea Schomburgkiana*.

But there is a rule which is above all others: "obscurity and confusion must be avoided." If that is admitted for a name (Vienna rules, art. 51, 4°), it must be recognized also in the quotation of the author. Hence we propose to maintain the author name, Kunth, for *Dioscorea Schomburgkiana* because: 1st, there is no doubt that in the two instances Kunth had exactly the same species in view; 2d, if a *Dioscorea Schomburgkiana* (Kunth) Hochr. would come into use, it would lead to the false idea that this plant is different from *Dioscorea Schomburgkiana* Kunth nomen. If one adopts our point of view, the plant quoted above must be considered as the type of the species.

IRIDACEAE

Solenomelus pedunculatus Hochr. comb. nov.

Sisyrinchium pedunculatum Gillies; Hook. Bot. Mag. *pl. 2965*. 1830.

Solenomelus chilensis Miers, Proc. Linn. Soc. **1**: 122. 1841; Proc. Linn. Soc. **19**: 95, *pl. 8*. 1842.

Cruikshanksia graminea Miers, Travels **2**: 529, *nomen nudum*. 1826.

Valdivia (*Bridges* 1862, *no. 773*).

There is no doubt that the oldest name is *pedunculatus* and, adopting the new binomial, it is an advantage to possess a definite specimen as a type, *i. e.*, the one of Cruikshank, quoted by Hooker. Miers based his species only on a drawing made by himself.

ORCHIDACEAE

Bulbophyllum sessile Hochr. comb. nov.

Epidendrum sessile Koenig; Retz. Obs. **6**: 60. 1779–91.

Bulbophyllum clandestinum Lindl. Bot. Reg. **27**: Misc. 77. 1841. — Hook. Fl. Brit. Ind. **5**: 753. 1890.

Oxysepala ovalifolia Wight, Ic. 5^1: 18. *t. 1736*. 1851.

Bulbophyllum trisetosum Griffith, Notul. **3**: 283. 1851.

There is no doubt that the correct name of this plant is *sessile*, as it is by far the oldest one.

Arundina graminifolia Hochr. comb. nov.

Bletia graminifolia Don, Prod. Fl. Nep. 29. 1825.

Limodorum graminifolium Hamilton, Don, *loc. cit.*, syn. 1825.

Arundina bambusifolia Lindl. Gen. et Sp. Orch. 125. 1831; Wall. Cat. *no. 3751*, *nomen;* Hook. f. Fl. Brit. Ind. 5: 857. 1890.

Cymbidium bambusifolium Roxb. Fl. Ind : 460. 1832.

It was decided in Vienna that publication in exsiccata has no value (Rules, art. 37). The name of Don must therefore be taken up. Besides, Wallich's name is very likely posterior, but the dates of the publications of Wallich are quite uncertain, as is well known.

Eulophia Dabia Hochr. comb. nov.

Bletia Dabia Don, Prod. Fl. Nep. 30. 1825.

Limodorum Dabia Hamilton; Don, *loc. cit.*, syn. 1825.

Eulophia campestris Wall.; Lindl. Gen. et Sp. Orch. 185. 1833.—Wall. Cat. *no. 7367*, nomen.—Hook. f. Fl. Brit. Ind. 6: 4.

Limodorum ramentaceum Roxb. Fl. Ind. 3: 467. 1832; Hort. Beng. 64, nomen.

Eulophia rupestris et *ramentacea* Lindl. Gen. et Sp. Orch. 185. 1833; id Wall. Cat. *nos. 7368* et *7370*, nomina.

Eulophia hemileuca Lindl. in Journ. Linn. Soc. 3: 25. 1859.

Acampe ochracea Hochr. comb. nov.

Saccolabium ochraceum Lindl. in Bot. Reg. Misc. 1842: 2. 1842; Hook. f. Fl. Brit. Ind. 6: 62.

Acampe dentata Lindl. Fol. Orch. Acamp. 3. 1853; Reich. f. Gard. Chron. 1752 (1872).

Saccolabium lineolatum Thwaites, Enum. 304. 1861.

Acampe Wightiana var. *longepedunculata* Thwaites, *loc. cit.*, 303. 1861.

It is impossible to join *Acampe* and *Saccolabium* because there would be then no reason to maintain several other genera as distinct. Amalgamating all of them with *Saccolabium* would make this genus quite impracticable. But if we maintain *Acampe*, the oldest name *ochraceum* of Lindley must be used.

MORACEAE

Cudrania spinosa Hochr. comb. nov.

Trophis spinosa Blume, Bijdr. 489. 1825.
Cudrania javanènsis Treub, Ann. Sci. Nat. III. **8**: 123. 1847. —Hook. f. Fl. Brit. Ind. **5**: 538.
Cudranus Rumphii Thwaites, Enum. 262. 1861.
Cudranus amboinensis Miq. Fl. Ind. Bat. **2**^{2}: 290. 1859.
Maclura amboinensis Blume, Mus. Lugd. Bat. **2**: 83. 1849–56.
Cudranus spinosus O. Kuntze, Rev. Gen. 623. 1891.

Australia (coll. R. Brown anno 1802–5) in Herb. N. Y. Bot. Gard.

Cudranus is a genus of Rumph, and is therefore excluded from the accepted nomenclature; but the specific name *spinosa* is prior and must be taken up.

LORANTHACEAE

LORANTHUS AMPULLACEUS Roxb. Fl. Ind. **2**: 189. 1824. —DC. Prod. **4**: 296

Loranthus sphaerocarpus Blume, Bijdr. 661. 1825; Fl. Jav. Loranth. *t. 17.* — DC. *loc. cit.* 297.
Macrosolen sphaerocarpus Miq. Fl. Ind. Bat. **1**^{1}: 830. 1855–59.
Loranthus globosus Hook. f. Fl. Brit. Ind. **5**: 220, *pro parte.*

If *L. ampullaceus* and *L. globosus* are to be kept as distinct species, *L. sphaerocarpus* must be united with *ampullaceus* and *not* with *globosus* as does Hooker. We have seen types of Blume, of Roxburgh, and plants named by Hooker himself; the type of *L. sphaerocarpus* Blume agrees with the plants named *L. ampullaceus* by Hooker and Roxburgh and not with the specimens labeled *L. globosus.*

OLACACEAE

Heisteria Burchellii Hochr. sp. nov. (e sect. *Leiocarpae* Engl.)

Lignosa; rami elongati, glaberrimi, cylindrici; ramulis subangulatis, internodia elongata. Folia glaberrima, simplicia, subcoriacea, late ovato-lanceolata, apice longe attenuato-acuminata, margine elegantissime crispato-undulata et basi acuta, petiolo breve. Flores breviter pedunculati, in foliorum axillis glomerati. Pedunculi fructiferi petiolis fere aequilongi, calyx auctus reflexus ore integer, ca. fructus longitudinis ⅔ attingens. Fructus drupaceus, oblongùs.

Petiolus 0.7–1 cm. longus; lamina in triente inferiore latissima, 18.5 × 5.5–12.5 × 3.5 cm. longa et lata, acumine ad 2 cm. metiente. Pedunculus fructifer ca. 1 cm. longus; calyx accrescens ca. 0.7–0.8 cm. longus. Fructus 1–1.2 cm. longus et 0.6–0.8 cm. latus.

Brasilia, Para (*Burchell no. 10099*, 1 Febr. 1830), in Herb. N. Y. Bot. Gard. et Kew.

This species has its place between *H. nitida* and *cyanocarpa*, on account of the relative size of the fruit and reflexed calyx. In habit it resembles *H. nitida* but, besides other characters, differs at first sight in having broader leaves and strongly undulate margins. It may be compared, also, with *H. Rhaptostylum* Tr. et Pl. However we have seen a young fruit of this species, the calyx of which was deeply lobed, so that it very likely belongs to a quite different group. Besides that, *H. Rhaptostylum* comes from Villavicensio and is a llanos or mountain plant, while our species is a tree of the low plains of the Amazon.

Notwithstanding the fact that I did not see good flowers, the location of our plant in the genus *Heisteria* must be correct, as it is the only one in the family showing an accrescent calyx of this form and reflexed, together with flowers standing each on its own stalk.

LAURACEAE

LITSAEA UNDULATA Hook. f. Fl. Brit. Ind. 5: 158

Pondicherry (*Perrottet no. 450*).

It is perhaps worth while, because it was considered as a Ceylon plant, to point out that this species occurs on the mainland. *L. ligustrina* Nees was the parallel species quoted for India, and as both are very closely allied they may be varieties of the same species. However, the difference indicated by Hooker is in the pubescence of the bracts, which are glabrous in *L. ligustrina* and pubescent in *L. undulata*. On this Pondicherry specimen they are distinctly pubescent.

CAPPARIDACEAE

Polanisia augustinensis Hochr. sp. nov. (e sect. *Eupolanisia* Pax)

Herba ± prostrata; caules ascendentes, ut planta tota, strigoso-pilosi. Folia trifoliolata, interdum caulium apice folia florifera simplicia; inferiora longe petiolata et variantia usque ad suprema fere sessilia; foliola obovata, apice rotundata, basi attenuato-

cuneata, margine integra, penninervia; nervi supra impressi, subtus valde prominentes. Inflorescentia laxe racemosa, aliquentulum foliosa; flores adulti distincte pedicellati sed alabastra fere sessilia; sepala acuta, extus ut planta tota strigosa; petala unguiculata, glabra, alba, apice rosea, sepalis triplo longiora; gynophorum brevissimum; stamina 10, inaequalia, minime 5 antherifera, filamenta filiformia. Fructus: siliqua anguste linearis, strigosa, acuminata, pedunculata et, gynophoro vix visibile, quasi pedunculi apice affixa.

Caules floriferi 15–20 cm. alti; petioli in foliis basilaribus ca. 2 cm. longi, in foliis caulinaribus 0.2–0.3 cm. longi et etiam breviores; foliola 1.7 × 0.7–1 × 0.45–0.5 × 0.3 cm. longa et lata. Pedunculi floriferi ca. 0.4–0.6 cm. longi, fructiferi 0.6–0.7 cm. longi; sepala ca. 0.2 cm. longa; petala 0.7 cm. longa et versus apicem 0.15–0.2 cm. lata. Siliquae maturae, quas vidi, ca. 3 cm. longae et 0.15 cm. latae; gynophorum fructiferum vix 0.05 cm. longum.

San Augustin bay, Madagascar (Herb. U. S. Expl. Exp., Capt. Wilkes, note B, 4: 200) in Herb. N. Y. Bot. Gard.

This species will be best referred to the group *P. arabica*, *tenella*, etc., but resembles very much in habit *P. strigosa* Bojer. It differs, however, 1st, in having a fruit which is almost sessile on the peduncle, and 2d, in the shape of the leaves.

ROSACEAE

Licania axilliflora Hochr. sp. nov. (e sect. *Eulicania* Hook.)

Lignosa; caules cylindrici, nigrescentes, apice tomentosi. Stipulae subulatae, petiolo aequilongae; petioli breves, tomentosi; lamina oblongo-lanceolata, apice acuminata, acumine plerumque lateraliter curvato, basi acuta, valde discolor, supra saturate viridis, nervo medio tomentoso excepto, glaberrima, subtus tomentosa, praeter nervos brunneos, canescens. Inflorescentiae axillares ad glomerulos minimos reductae, cum floribus petioli longitudinen non excedentes; flores parvi, sessiles, basi bracteis minimis praediti; axis floralis cupularis, ut calyx extus tomentoso-canescens et intus pilosus; calyx 5-lobus; petala nulla; stamina ca. 6, calyce vix aequilonga; antherae oblongae. Ovarium globosum, villosum; stylus gynobasicus, cylindricus, pilosus.

Petiolus ca. 0.3 cm. longus, lamina 7.5 × 2.6–4 × 1.3 cm. longa et lata; cupula cum calyce vix 0.2 cm. longa.

Roraima, Guyana Brit. 1842–43 (*Schomburgk no. 868*) in Herb. N. Y. Bot. Gard. et Kew, (*Sagot no. 1281*) in Herb. Kew.

This species differs from all others in having inflorescences forming glomerules in the axils of the leaves.

THEACEAE

Archytaea alternifolia Hochr. comb. nov.

Hypericum alternifolium Vahl, Symb. **2** : *t. 42.* 1791. — DC. Prod. **1** : 545.

Ploiarium elegans Korth. in Tamminek Verh. Nat. Geschied. Bot. 135. 1839–42; Miq. Fl. Ind. Bat. **1**^{2} : 491.

Archytaea Vahlii Choisy, Mem. Ternstr. 73. 1855. Hook. f. Fl. Brit. Ind. **1** : 294.

Borneo (U. S. S. Pacif. Exp. Exp., Capt. Wilkes, note B, **5** : 24 a. 25).

LEGUMINOSAE

Stryphnodendron pulcherrimum Hochr. comb. nov.

Acacia pulcherrima Willd. Sp. Pl. **4**: 1061. 1806, fide O. Kunze Rev. I, CXXXV.

Mimosa pulcherrima Poiret, Encycl. Supp. **1** : 66. 1810.

S. floribundum Benth. in Hook. Journ. Bot. **4**: 343. 1842; Benth. in Mart. Fl. Brasil. **15**^{2} : 286.

Guyana, Roraima (*Schomburgk no. 799*), in Herb. N. Y. Bot. Gard.

Bentham himself (Mart. Fl. Brasil, *loc. cit.*) says that *S. floribundum* = *A. pulcherrima* Willd. and that it is very closely allied to *Piptadenia* (or *Stryphnodendron*) *guyanensis;* but the two species are kept separate and Bentham makes a note in which he quotes *Schomburgk no. 799* as *S. floribundum.*

The originals of *S. guyanense* in Herb. Paris have the leaflets very variable in size, but none of them has such small ones as our plant. Therefore Bentham was entitled to keep the two species separate; but if *S. floribundum* (= *A. pulcherrima*) is a distinct species, it must bear the prior name *S. pulcherrimum.*

DIMORPHANDRA BIRETUSA Tul. Arch. Mus. Paris **4**: 184

Brasilia trop. (*Blanchet no. 3092*) in Herb. N. Y. Bot. Gard.

If we compare *Blanchet no. 3092*, which is the type of *D. biretusa* Tul., and *Gardner no. 1944*, which is the type of *D. Gardnerana* Tul., we find them specifically different. *D. Gardnerana* has smaller and thicker leaflets, with recurved margins, and shorter petiolules than in our species; they are always less than 1 mm. long. Besides, the anatomy of the leaflet is different, the epiderm of *D. Gardnerana* being characteristically sclerose. The inflorescence axes of *D. Gardnerana* also seem a little thicker.

Therefore we believe that the synonymy established by Bentham is not well founded and the two species of Tulasne must be maintained. (Cf. Benth. in Mart. Fl. Bras. **15**^{2} : 252.)

Cynometra Schottiana Hochr. sp. nov.

Caules lignosi ± cylindrici, glabrescentes, lenticellati. Folia unijuga; petiolus cylindricus, glaber et per ejus totam longitudinem articulationis structuram praebens; foliola glabra, valde asymmetrica, ± oblongo-lanceolata, basi in petiolo sessilia, margine integra, apice longe obtuseque et interdum retuse acuminata; lamina penni- et reti-nervis, nervaturis supra subtusque prominentibus. Inflorescentiae axillares, racemosae, ut in genere bracteatae; bracteae ovatae vel oblongae, crebre parallelinerves, extus, praecipue apice, adpresse minuteque pilosae; pedicelli et axis ferrugineo-hirsuti. Sepala oblongo-lanceolata, glabra, subanthesi reflexa. Petala sepalis aliquantulum longiora, lanceolata, acuta, interdum subacuminata, glaberrima. Stamina petalis sensim longiora, subaequilonga; antherae oblongae, dorsi-fixae. Urceolus extus ferrugineo-hirsutus, intus glaber. Ovarium breviter stipitatum, urceoli basi insertum, ab apice usque ad basin dense ferrugineo-hirtellum. Stylus glaber, apice indistincte capitellatus, diu persistens, paulo arcuatus. Fructus novissimos tantum vidi, oblongos.

Petioli 0.7–1 cm. longi et ca. 0.2 cm. in diam. crassi, lamina foliolorum 12.5 × 5.5–11 × 4.6–8 × 2.9 cm. longa et lata; acumine plerumque 1–1.5 cm. longo. Inflorescentiae totae ± 3 × 3 cm. longae et latae; bracteae 0.2–0.5 cm. longae; pedicelli, floriferi 0.6–1.2 cm. longi, fructiferi juniores ad 1.5 cm. longi. Sepala 0.4–0.5 cm. longa. Petala 0.6–0.7 cm. longa et 0.2 cm. lata. Stamina 0.7–0.9 cm. longa. Stylus 0.2–0.3 cm. longus. Fructus immaturi, quos vidi, ad 6 × 4.5 mm. longi et lati.

Nova Grenada, Trementino, Atrato and Truando-river (*Schott XII, 857; and id. XII, I, II, 185, 7/8, Leguminosae no. 7*) in Herb. N. Y. Bot. Gard.

This *Cynometra* differs from nearly all other species by its very large and acuminate leaves. It resembles *C. trinitensis* Oliv., but differs in having a glabrous calyx, longer peduncles and thinner leaves. Our species must be placed close to *C. Hostmanniana*, the latter differing however by its glabrous peduncles and smaller flowers; the petals are only about 4 mm. long.

LEBECKIA SARCOPHYLLOIDES Mey. Linnaea **7** : 155. 1832

L. Simsiana Ekl. & Zey. Enum. 192. 1834–37, *no. 1338*. — Harv. & Sond. Fl. Cap. **2** : 86.

Sarcophyllum carnosum Sims, Bot. Mag. *t. 2502*, non Thunb.

Var typica Hochr. var. nov. (*Lebeckia sarcophylloides sensu str.*)

Folia minora 3.5–6.2 cm. longa et 0.5 mm. lata, fasciculata, internodia breviora, caules angulati; flores in caulium apice numerosi et suffulti.

Afr. Austr. *(Ekl. et Zey. no. 1338).*

Var. major Hochr. var. nov.

A typo differt foliis longioribus, 4–7 cm. longis et fere 1 mm. latis, quam in var. *typica* crassioribus, fasciculatis, internodiis longioribus, caulibus cylindricis, floribus in caulium apice paucioribus et magis distantibus.

Africa australis (Bernard Fuller Aug. 1888), in Herb. N. Y. Bot. Gard.; id. (*Wolley Dod*, *no. 3466*) in Herb. Kew.

Except *Dod no. 3466* all specimens of the Kew herbarium belong to the variety *typica*, but some of them are intermediate forms, for instance *Burchell no. 7204*. The name *carnosum* is older but it was given by Curtiss to a plant which is not *S. carnosum* Thunberg; therefore later on an author was not bound to take up this name again in the new genus, because it was not valid. In consequence the binomial *Lebeckia sarcophylloides* is correct.

MALPIGHIACEAE

Hiraea platytriphylla Hochr. sp. nov.

Caules tomentosi, sordide ferruginei, novissimi subtrigoni. Folia ternata; petiolus supra applanatus vel canaliculatus, ut caules tomentosus, in longitudinis medio, vel supra, stipulifer; stipulae parvae; subulatae, tomentosae; lamina late elliptica, pilosa, tactu velutina, subtus tomentosa et ± canescens, apice rotundata et abrupte acuminata vel etiam mucronata, basi anguste cordata, quasi auriculas duas efformans; lamina penninervis, utrinque 10–11 nervos laterales praebens. Inflorescentiae axillares; umbellae plerumque 3-florae in glomerulos vel racemos dispositae; umbellae bracteis dentiformibus 4–6 involucratae. Flores longe pedicellati, pedicelli adpresse ferrugineo-sericei. Calyx 5-partitus, extus ut pedicelli adpresse ferrugineo-sericeus, intus glaber; sepala ovata, apice subrotundata, nec glandulosa. Petala longe unguiculata, lamina subcircularis, fere integra, ± crispata. Stamina 10, basi dilatato-concrescentia, glabra. Carpidia in toro hirsutissimo inserta, 3, glabra, in stylum, apice stigmate ± infundibuliforme terminatum, attenuata. Samara dorso cristata (crista parva laciniata) et utrinque alata; alis duabus, magnis, semicircularibus, adpresse et parce sericeis, margine subsinuatis.

Petioli 0.7–1.8 cm. longi; lamina 9.5 × 4.5–11.3 × 5.6–18 × 9

cm. longa et lata; mucro 0.1–0.2 cm. longum; stipulae ca. 0.4 cm. longae. Inflorescentiae 3.5–4.5 cm. longae. Umbellarum pedunculi 1–0.5 cm. longi, florum pedicelli 2–2.5 cm. longi. Sepala ca. 0.3 cm. longa et basi 0.2 cm. lata. Petala ca. 0.8 cm. longa; unguiculo ca. 0.3 cm. longo. Stamina ad 0.3 cm. longa. Samarae alae 1.5–1.8 cm. a nuculo ad marginem latae et ad 2.3 cm. altae; crista vix 0.3 cm. lata, carpidium ipsum vix 0.5 cm. altum.

Nova Grenada, Magdalena (*Holton*, Sept. 1852, *no. 802*), in Herb. N. Y. Bot. Gard. and Kew.

I first identified this plant with *Hiraea ternifolia* A. Juss., founded upon *Malpighia ternifolia* H.B.K., but after examining the original in Herb. Bonpland in Paris I found that it differs very much from our plant. It has narrower leaves which are never cordate at the base, and smaller flowers with thinner peduncles. Besides, the plant of Jussieu has calyx glands which are very obvious, while they are not to be seen on our specimen. Certainly our plant resembles much more *Malpighia obovata* from Rio Magdalena than the one previously named; but *M. obovata* differs by having obovate leaves which are nearly glabrous underneath, and by its peduncles which are woolly and whitish instead of ferrugineous. This plant is regarded, therefore, as a new species.

The name is derived from the fact that the leaves are ternate as in *M. ternifolia* (triphylla) but much wider (platy).

Heteropteris multiflora Hochr. comb. nov.

Malpighia reticulata Poir. Encycl. Supp. **4**: 8. 1816.
Byrsonima reticulata DC. Prod. **1**: 581. 1824.
Heteropteris reticulata Niedenzu, Mon. in Arb. Bot. Inst. Lyceum Hosianum 54, Braunsberg (Juin 1903) non Griseb.
Banisteria multiflora DC. Prod. **1**: 589. 1824.
Heteropteris platyptera Griseb. in Mart. Fl. Bras. **12**: 67 *pro parte*, non DC.

Surinam, Guyana (*Schweinitz*), in Herb. N. Y. Bot. Gard.

Like Niedenzu, I do not believe that the West Indian plant called *Banisteria longifolia* by Swartz (Prod. **1**: 589. 1800) and *Banisteria macrocarpa* by Persoon (Enchir. **1**: 507. 1805) is identical with our plant. All West Indian specimens bear the indication "vine," "scandens" or "scandent shrub," while the ones from Guyana are said to be trees. Comparing both roughly, I find also that the flowers of the West Indian plants are somewhat smaller than those from South America. Therefore we agree with the arrangement of Niedenzu, but we cannot accept his nomenclature. He calls our plant (from Guyana) *H. reticulata* Niedenzu, because *reticulata* is the oldest specific name. But there is already a *H. reticulata* Grisebach, in Mart. Fl. Brasil. **12**^{1}: 71, which is quite a different species; however, Niedenzu apparently disregards this and without any reason simply changes the name *H. reticulata* Griseb. to *H. Grisebachiana* Niedenzu. There is no need to remark that such a method is contrary to the accepted rules of nomenclature. *H. reticulata* Griseb. must keep its name, and the next available name must be used for our species. This is *Banisteria multiflora* DC., which must be transferred into the genus *Heteropteris*.

The second species from the West Indies is called by Niedenzu *Heteropteris longifolia* Niedenzu, on account of *Banisteria longifolia* Sw. (Prod. **1**: 589. 1800). But there is also an older *H. longifolia* H.B.K. Nov. Gen. Amer. **5**: 166. 1821. However, the case is somewhat different here, because Niedenzu considers *H. longifolia* H.B.K. as a synonym of *H. laurifolia* (L.) Juss.; therefore, following the Vienna rules, he has the right to take up again the name *longifolia* for a different species. But we find the method very bad, the more so, because Niedenzu admits that *H. longifolia* H.B.K. is not quite identical with *H. laurifolia* Juss., and he makes a subvariety of it. Now one may judge of the mixture of names if another monographer wants to restore *H. longifolia* H.B.K. as a distinct species.

EUPHORBIACEAE

Actinostemon Schomburgkii Hochr. comb. nov.

Dactylostemon Schomburgkii Klotzsch, in Hook. Lond. Journ. Bot. **2**: 45. 1843; in Wiegm. Arch. **7**: 181. 1841, nomen; Mull.-Arg. in DC. Prod. **15**^{2}: 1198.

Guyana Brit., Roraima (*Schomburgk* 1842–3, *no. 939*), in Herb. N. Y. Bot. Gard.

EUPHORBIA XALAPENSIS H.B.K. Nov. Gen. **2**: 61; Boiss. in DC. Prod. **15**^{2}: 53. **Var. valida** Hochr. var. nov.

A typo differt habitu non tam elongato (in typo caules magis elongati et minus crassi) caulibus et inflorescentia pilosioribus, inflorescentiae ramis brevioribus (in typo rami foliis axillaribus fere

aequilongi), denique foliorum nervis secundariis numerosioribus, 6–8 (in typo utrinque ca. 5).

Guatemala, in locis umbrosis, Cumbre de Atitlan (*Gust. Bernouilli* Jun. 1870, *no. 643*).

Compared with the type of Bonpland, in Herb. Paris, I find it so different that I cannot but separate the two plants, at least as two different varieties.

MYRTACEAE

Syzygium Schlechterianum Hochr. sp. nov.

Lignosus; caules glabri, cylindrici, juniores ± angulati. Folia opposita, sessilia, obovato-lanceolata, parva, glaberrima, basin versus longe attenuata, apice contracto-obtusa, margine paulo revoluta, supra nitentia, nervo medio impresso, subtus pallidiora, nervis omnibus prominentibus. Inflorescentiae terminales, vel *in foliorum axillis* axillares, ramorum parte superiore congestae, ut in speciebus aliis, cymas trichotomas efformantes, longitudinem foliorum non excedentes; inflorescentiae axes glabri ± angulati. Alabastra clavata in pedicellos breves attenuata. Calyx glaberrimus fere non lobatus. Petala libera, parva, caducissima.

Folia 2.2×0.6–2.3×0.8–2.7×1 cm. longa et lata; internodia 0.5–3 cm. longa. Inflorescentiae 1.5–2.2 cm. longae, pedicelli vix 0.1 cm. longi; flores vix 0.2 cm. in diametro lati.

Puebo, Nova Caledonia (*Deplanche no. 356*), in Herb. N. Y. Bot. Gard., Kew, and Paris.

It closely resembles *S. patens* Pancher, but is quite distinct from it, *S. patens* having larger flowers, thicker pedicels and inflorescence axes, its obovate leaves being rounded and emarginate at the top. Our species must be placed in the group of *Eugenia* — eventually *Syzygium Zeylanicum* DC.

Dedicated to Dr. Schlechter, who first pointed out that it might be a new species.

PSIDIUM SALUTARE Berg, Linnaea **27**: 356. 1854

Berg in Mart. Fl. Brasil. made a mistake in quoting *Schomburgk no. 941* under *Psidium parviflorum* Benth. Journ. Bot. **2**: 318, because this number in Herb. N. Y. Bot. Gard., as well as in Herb. Kew, is without any doubt *Psidium salutare*.

The type of *Psidium parviflorum* which may be seen in Herb. Kew differs even at first sight by its smaller and nitescent leaves.

Eugenia kanalaensis Hochr. sp. nov. (e sect. *Eueugenia* § *glomeratae*)

Caules lignosi, etiam juniores cylindrici, glabri. Folia crassa, glabra, opposita, late lanceolata, margine integra, sed interdum crispato-undulata, basi in petiolum acutata, apice acuminata, acumine obtuso vel retuso; petioli mediocres glabri, supra depresso-canaliculati; lamina obscure penninervis, nervi secundarii duo inferiores, arcuati, longi, secundum marginem dispositi et cum eo paralleli fere usque ad laminae apicem percurrentes. Inflorescentiae parvae, axillares et terminales; capitula pedunculata, interdum bracteis duabus subulatis caducissimis praedita, 1–3-flora, interdum flos unus tantum apice pedunculi insertus; pedunculi quam petioli fere aequilongi, parce et minute, tomentelli; flores parvi; bracteae dentiformes, minimae, fere non visibiles. Hypanthium pyriforme, infra calycem constrictum, ut calyx extus parcissime et minute pilosum. Sepala 4, ob margines aliquantulum involutos, triangularia, intus dense pilosa. Petala 4, imbricata, breviter unguiculata, oblonga, glabra, si expansa calyce fere duplo longiora. Stamina ∞; filamenta longissima, calyce triplo longiora et plus; antherae oblongae glandula peculiari apice notatae. Stylus simplex cylindricus, apice truncatus. Ovarium, 3-loculare, loculis pluriovulatis in hypanthii parte medio locatis, i. e. hypanthium supra ovarium non productum.

Petioli 6–8 cm. longi; lamina 3.6 × 1.8–4.8 × 1.9–4.4 × 2.2 cm. longa et lata, acumine ± 1 cm. longo. Inflorescentiarum pedunculi ca. 0.5 cm. longi. Hypanthium ca. 0.2 cm. longum et 0.15 cm. in diam. crassum. Sepala ca. 1.5 mm. longa et 1–1.5 mm. basi lata; calycis cupula ca. 2.5 mm. in diam. lata. Petala cum unguiculo ± 3.5 mm. longa et ± 1.5 mm. lata. Stamina 3–6 mm. longa. Stylus 5–6 mm. longus.

Nova Caledonia, montagnes du lac à Kanala 1861–67 (*Vieillard no. 2627*), in Herb. N. Y. Bot. Gard. and Kew.

On account of its ovary and ovules, we connot relate this plant to any other genus than *Eugenia*. However, the 3 cells of the ovary is not very usual in that genus and in order to give an idea of the habit we must rather compare our plant to *Nelitris paniculata* and *vitiensis*, from which it differs even on the exterior by the glabrescence and the form of the inflorescence.

Our plant resembles also *E. Mooniana* Wight, Ill. II, 13, especially concerning the form and size of the leaves. But if we consider the figure given by Wight in his Icones, II, 551, we see that *Eugenia Mooniana* differs from ours also by its larger flowers which are much longer pedunculate and always solitary at the end of one peduncle.

MELASTOMATACEAE

Blakea Holtonii Hochr. sp. nov. (e sect. *Eublakea* Triana)

Rami tetragoni, apice furfuracei. Folia oblongo-elliptica, basi in petiolum attenuata; petioli juniores stellato-furfuracei, demum glabrati, supra canaliculati; lamina coriacea, margine integra, apice in apiculum brevem et obtusum abrupte acuminata, 5-plinervia, nervis secundariis fere perpendicularibus creberrimis, 1½–3 mm. distantibus; limbus supra viridis, glaberrimus, ob calcii oxalati ursinos numerosissimos prominentes minutissime atque eleganter verruculosus, subtus viridi-brunneus, glabrescens, sed secundum nervos primarios stellato-furfuraceus. Flores magni, solitarii, axillares, breviter et crasse pedunculati; bracteae 4, magnae, apice rotundatae, extus fere glabrae vel parce stellato-furfuraceae, basi per duas connatae, florem quasi bis involucrantes. Calyx glaber, 6-lobatus, lobis brevibus, rotundatis, circa ad medium connatis; hypanthium turbinatum. Stamina 12, aequalia; filamenta crassiuscula, glabra; antherae crassae, compresso-pyriformes, basi lateraliter cohaerentes, apice attenuatae, liberae, et ibidem postice calcar brevissimum gerentes. Discus latus, in stylum basi conicum, apice subtruncatum, attenuatus.

Petioli 1.5–2.3 cm. longi; lamina 8.3 × 4.6–13 × 6.2 cm. longa et lata, apiculo 0.25–0.6 cm. longo et ca. 0.3 cm. lato. Pedunculus, quum vidi, 1.5 cm. longus. Bracteae exteriores 1.8 cm. longae et 1.5 cm. in liberi partis basi latae, bracteae interiores ca. aequilongae. Sepala a basi ca. 0.7 cm. longa; calyx expansus ore ± 2.3 cm. in diam. latus. Filamenta 0.8–1 cm. longa; antherae siccae 0.55 cm. longae, 0.35 cm. latae et basi ad 0.25 cm. crassae. Discus ca. 1.25 cm. in diam. latus.

Nova Grenada, ad cataractam Tequedamam (Flora Neogranadina-Bogotana, *Holton*, 8 Déc. 1852), in Herb. N. Y. Bot Gard.

On account of its leaves being petiolate, and its connate bracts, which do not hide the calyx, this species must be placed next to *B. rostrata* or *caudata*, if we follow Cogniaux's monography in DC. Mon. 7: 1077. But the leaves of those species are quite different and their flowers are long pedunculate.

On account of the habit, our species is very much like *B. grandiflora* Hemsley. The leaves are almost identical, but the flower is much smaller, the bracts and sepals acuminate and the leaves destitute of the peculiar appearance due to the presence of innumerable crystals of oxalate under their upper epiderm. This last character may be seen equally well on the leaves of *B. trinervia* which differs, however, from ours by having the bracts free, and long peduncles, measuring 5–6 cm. and exceeding very much the length of the petioles.

Topobea discolor Hochr. sp. nov.

Rami cylindrici, in nodis incrassati, parte superiore ut petioli et pedunculi ± dense ferrugineo-puberulentes. Foliorum lamina oblongo-elliptica, basi acuta, apice longe acuteque acuminata, margine integra, valde discolor, in sicco supra grisea glaberrima, subtus saturate brunnea et parcissime puberula, pilis squamaeformibus, praecipue in nervis primariis locatis; folia pentaplinervia, nervis transversalibus horizontalibus, creberrimis. Flores axillares, prob. solitarii, breviter pedunculati; bracteae liberae, latissime ovatae, intus et extus sparce puberulae, exteriores acuminatae, interiores acutae, omnes calyce minores. Calyx turbinatus, 6-lobatus, lobis parvis triangularibus, intus extusque puberulis; tubus extus puberulus, intus glaberrimus. Petala 6, in alabastro valde convoluta, prob. obovata (non vidi plane evoluta), tubo calycino ca. medio inserta. Stamina linearia. Ovarium liberum, sed inferne cum calyce adhaerens, ovoideum, vertice depresso cum areola intrusa. Stylus cylindricus, apice truncatus.

Petioli 1–2.3 cm. longi, lamina cum acumine 6.4 × 2–8 × 3.5–*11.5* × *4.3*–13 × 4.7 cm. longa et lata, acumine tantum ca. 1.5 × 0.2 cm. longo et lato. Pedunculi 0.3–0.7 cm. longi; bracteae 0.6–0.8 cm. longae, exteriores ad 0.9 cm. longae. Calyx 1.1–1.3 cm. longus; lobis 0.1–0.15 cm. longis; calyx apertus ore 0.8–1 cm. in diam. latus. Petala in alabastro 0.2–0.4 cm. calycem excedentia. Antherae juniores 0.5 cm. longae et vix 0.1 cm. latae. Stylus ca. 0.8 cm. longus.

Nova Grenada, Truando (*Schott* XII, 1857, *Melastomaceae no. 2*).

This species may readily be recognized by its discolored leaves. Its systematical place is next to *T. subscabrula* and *setosa* on account of the free bracts and the puberulous stems and petioles. It differs however from both by the much narrower leaves, and the flowers larger than in *T. subscabrula* and smaller than in *T. setosa*.

LOGANIACEAE

CYNOCTONUM MITREOLA Britton, Mem. Torrey Club 5: 258. 1894

Ophiorrhiza Mitreola L. Sp. Pl. 150. 1753; Sw.; Lam.
Mitreola paniculata DC. Prod. 9: 9. 1845; Wall. Cat. no. 1826, in exsicc.; Hook. Icon. *t. 828*.
Cynoctonum petiolatum Gmel. Syst. 443. 1791.
Mitreola petiolata Torr. et Gray Fl. N. Amer. 2: 45. 1846.
Mitreola oldenlandioides DC. Prod. 9: 9. 1845; Wall. Cat. no. 4350, in exsicc.

Ophiorrhiza lanceolata. Ell. Sk. 1: 238. 1821–24.

Mitreola ophiorrhizoides A. Rich. Mem. Soc. Hist. Nat. Paris 1: 63, *t. 3.* 1823. *pro parte.*

Mitreola Swartzii G. Don Gen. Syst. 4: 171. 1831–37.

Anonymos petiolata Walt. Car. 108. 1788.

(*Mitreola inconspicua* Zoll. et Mor. Verz. Pl. Jav. 55, fide Bentham in Journ. Lin. Soc. 1: 91.)

Serra de Jacobina, Prov. Bahia, Brasilia (*Blanchet no. 2548*), in Herb. N. Y. Bot. Gard. Specimen sine fruct. quoad variet. indeterminandum.

There are two extreme forms of that plant. The one is called *M. paniculata* Wall. ex DC. Prod. (=*M. petiolata* Torr. and Gray) with capsule lobes curved towards each other, so that the whole fruit looks nearly spherical. The other is called *M. oldenlandioides* Wall. ex DC. *loc. cit.*, with spreading capsule lobes. That is why de Candolle separates those two plants.

But there are all links between, and in regard to many specimens it is impossible to determine to which species they may best be referred. That is particularly the case in connection with the specimen of the Linnaean herbarium which has capsule lobes exactly intermediate between the types of *paniculata* and *oldenlandioides* Wall. ex DC. Therefore I have thought it best to unite the whole lot into one species, divided into two or better in three varieties, the first with curved lobes, the second with straight lobes, and the third with lobes of an intermediate form.

In regard to the names of the varieties, a strict adherence to rules would require that the oldest name for each should be sought and applied, but this is not practical on account of the present confusion in this connection. In order to give an idea of it, we shall endeavor to show what happened to Progel, the author of LOGANIACEAE in Mart. Fl. Brasil, 6^1: 266.

1. Under the name and synonymy of *M. petiolata* Torr. and Gr. he describes and figures (*t. 82, f. 1*) *wrongly* the plant with *spreading* capsule-lobes and, as an instance of that, he quotes *Gardner no. 3897*, which has *curved* lobes!

2. Under the name of *M. paniculata* Wall., which he wrongly considers as distinct from *petiolata* Wall., he correctly describes and figures (*t. 71*) the species with curved lobes; but he quotes, as a synonym *M. oldenlandioides* which has straight capsule-lobes.

In regard to the older authors like Walther, Don, and Richard, it is impossible to make out exactly which form they had in view. In order to find anything definite about the two forms of the capsule we must take de Candolle's names based on Wallich's plants. But one can imagine how such names would only increase the confusion. Therefore we propose the following systematic arrangement.

Var. campylocarpa Hochr. nom. nov.

Fructus lobi valde incurvati.

M. paniculata Wall. ex DC. *loc. cit.;* Hook, Ic. *t. 828;* Progel in Mart. Fl. Brasil. *loc. cit.*, syn. exclus.

M. petiolata Torr. et Gr. *loc. cit.;* Benth. in Journ. Lin. Soc. 1: 91.

Cynoctonum petiolatum Gmel. *loc. cit.*

Brasil. Prov. Goyaz (*Gardner no. 3897*) in Herb. N. Y. Bot. Gard.

Var. orthocarpa Hochr. nom. nov.

Fructus lobi valde divergentes.

M. oldenlandioides Wall. ex DC. *loc. cit.;* Benth. *loc. cit.*

M. petiolata Progel in Mart. *loc. cit.*, non Torr. et Gr.

(*M. inconspicua* Zoll. et Mor. Verz. Pl. Jav. 55, fide Benth.)

Var. intermedia Hochr. nom. nov.

Fructus lobi partim incurvati, i. e. forma intermedia.

Ophiorrhiza Mitreola L. sensu stricto, quoad specimen Linneanum.

Except for the forms of the capsule, I could not find any other constant character separating the varieties of *Mitreola*.

In regard to distribution, the *var. campylocarpa* is more frequent in Brazil, but both of the extreme forms may be met with in India as well as in America.

OLEACEAE

Osmanthus vaccinioides Hochr. comb. nov.

Notelaea vaccinioides Schlechter in Engl. Jahrb. 39: 230. 1906.

Cap Tounesse, Nov. Caledon. (*Deplanche herb. no. 323*), in Herb. N. Y. Bot. Gard. and Kew.

After examining the figure given by Schlechter I do not hesitate to identify our specimen with it, but I must object that the plant has a quite gamopetalous corolla, the lobes of which are distinctly imbricate. That is why I feel bound to refer this species to the genus *Osmanthus*. Schlechter's figure also shows that the petals are imbricate in the bud.

MENTHACEAE

PROSTANTHERA MARIFOLIA R. Br. Prod. 509; Benth.
Fl. Austr. 5: 98

Bentham says in the analytical key of the genus, for the group to which this species belongs: "leaves not rugose." I wish to call attention to it, because it is an obvious error which may lead to false naming. All specimens of this species in the Kew herbarium, and especially the type, are very rugose. They were all named by Bentham so that there is surely an error in the wording of the description, which is probably a misprint.

SOLANACEAE

BASSOVIA SOLANACEA Benth. et Hook. ex Daydon Jackson
Ind. Kew. 1: 278. 1893

Witheringia solanacea L'Her. Sert. Angl. 1: 33.
Capsicum solanaceum O. Kunze Rev. 1: 450.

Var. glabrescens Hochr. comb. nov.

Capsicum solanaceum var. *glabrescens* O. Kunze, *loc. cit.*

Nov. Grenada, El Roble, Guindio, alt. 2000 m. (*Triana no. 2282*), in Herb. N. Y. Bot. Gard.

Bentham and Hooker in their Gen. Pl. 2: 891, did not build the binomial name attributed to them by the Index Kewensis. Now I do not think it practical to enlarge the genus *Capsicum* to such an extent, and to combine with it so many other genera as Kuntze does. That is why I transfer the variety of Kuntze into the genus *Bassovia*.

Cyphomandra Holtonii Hochr. sp. nov. (e sect.
Euthystemon Miers, Ill. Pl. S. Amer. 1: 41)

Caulis suffrutescens, cylindricus, glabrescens, sed sub lente validissima minute glanduloso-papillosus. Folia petiolata, glabrescentia sed ubique ut caules minutissime glanduloso-papillosa; petioli subcylindrici, quam lamina breviores; lamina late ovata, basi ± profunde cordata, apice acuminato-acuta, margine integra, palmati-5–7-nervis, nervus medianus distanter penninervis, nervis omnibus subtus prominentibus. Inflorescentiae ± axillares et terminales racemosae, ± scorpioideae, pedunculatae, simplices vel

± ramosae, interdum 20-florae. Flores unilateraliter dispositi, longe pedicellati, pedicelli flexuosi; alabastra ovato-lanceolata, acuminata. Calyx cupuliformis, late apertus, ut planta tota glabrescens et minutissime papillosus, ore brevissime 5-lobatus, lobis subtruncatis et medio mucronatis. Corolla 5-partita, lobi anguste lineari-lanceolati, glabrescentes sed margine et apice intus minute pubescentes, calyce multoties longiores; tubus corollinus calyce circa aequilongus. Stamina petalis duplo breviora; filamenta brevia, basi latiora et cum corollae coalescentia; antherae subulatae luteae, apice poricidae; connectivum, in antherae dorso situm, basi latum usque ad antherae apicem attenuatum, brunneum et dense papillosum. Ovarium oblongum, apice in stylum ovario conspicue longiorem, cylindricum, glabrescentem, staminibus aliquantulum longiorem et petalis breviorem, apice clavato-capitellatum, attenuatum.

Petioli 3–1.5 cm. longi; lamina cum lobis basilaribus 9 × 5–7 × 4.8–5.8 × 4.1 et interdum 3.7 × 2.5 cm. longa et lata. Inflorescentiarum pedunculi (quos vidi) 3–4 cm. longi; rachis vel inflorescentiarum rami, 2–7 cm. longi, florum pedicelli 1.5–2.6 cm. longi. Calyx ca. 0.35 cm. longus et ore 0.5 cm. in diam. latus; lobis 0.1 cm. profundis. Corolla aperta 1.9 cm. longa, lobis ca. 1.7 cm. longis et basi vix 0.2 cm. latis. Filamenta ca. 1.5 mm. longa; antherae 6–7 mm. longae, basi ca. 1.5 mm. latae. Stylus cum ovario 1.2–1.3 cm. longus.

Nova Grenada, Barcinal (*leg. Holton*, 24 Nov. 1853, *no. 555*) in Herb. N. Y. Bot. Gard. and Kew.

This species belongs very likely to the group *Euthystemon*, but it is rather difficult to state its affinities, owing to the form of the calyx. There are two groups of *Cyphomandra* very well characterized: the one with a large, conical, expanded and, at the margin, nearly truncated calyx, and the other with small but distinctly and deeply lobed calyx.

The calyx of our plant has the form of the large calyculate species with its 5 mucrons but it is more than five times shorter than the petals, so that it is undoubtedly a small calyculate *Cyphomandra*. However, in that group it must be placed near *C. oxyphylla*, *capsicoides*, *laxiflora* and *divaricata*, if we follow the arrangement of Dunal in DC. Prod. 13^1: 397. They all differ by their pubescence and deeply cleft calyx.

In habit our species resembles *C. corymbiflora*, which differs chiefly by its more divided inflorescences with shorter and more divaricate branches. It differs also in being more hairy. *Fendler no. 2099* from Venezuela, in the Kew Herbarium, may be the same species. It is at least very similar.

SCROPHULARIACEAE

EUPHRASIA ANDICOLA Benth. in DC. Prod. **10**: 554

Lamourouxia andicola Gillies ex Benth. *loc. cit.*

In spite of what Bentham says in his description, *E. andicola* has somewhat pubescent stems, as may be seen on Gillies' type.

BIGNONIACEAE

PITHECOCTENIUM CINEREUM DC. Prod. 9: 195. 1845

Var. parviflorum Hochr. var. nov.

A typo differt foliis minoribus, 3.1 × 1.8–1.9 cm. longis et latis, glabrescentibus (in typo folia 3.2 × 2–3.5 × 2.2 cm. longa et lata, dense tomentosa), corolla minore 4 cm. longa et 3 cm. lata, ore expanso (in typo corolla ad 6 cm. longa et 4.5 cm. lata).

Near Mexico, by Rocha, collectore incognito. In Herb. N. Y. Bot. Gard.

ACANTHACEAE

ARRHOSTOXYLUM FULGIDUM Nees ab Es. in Mart. Fl. Brasil. 9: 59

Ruellia fulgida Adr. Rep. Nov., Spreng. Syst. **2**: 824

Var. angustissimum Hochr. var. nov.

A typo differt foliis angustioribus, brevius petiolatis; petioli 0.5–1 cm. longi, lamina 7.5 × 1.7–12 × 2.5 cm. longa et lata (in typo folia ovata 18 × 12–11 × 4.2–14 × 6.5 cm. longa et lata, petioli 2–8 cm. longi). Pedunculi apice plerumque flores minus numerosos quam in typo gerentes, semper simplices, et nunquam (ut in typo) inflorescentias vel bracteas gerentes. Capituli unici bracteae, ut in var. β Nees, in petiolum attenuatae.

Nov. Grenada, La Paila (*Holton*, 23 Apr. 1853, *no. 599*), in Herb. N. Y. Bot. Gard. and Kew.

DIANTHERA SECUNDA Griseb. Fl. Brit. W. Ind. Isl., 455; Hemsl. Biol. **2**: 519

Rhytiglossa secunda Nees ab Es. in DC. Prod. **11**: 340.
Justicia secunda Vahl Symb. Bot. **2**: 7.

Var. Holtonii Hochr. var. nov.

A typo differt foliis angustioribus, longissime acuminatis; floribus caulis apice confertissimis, bracteis primi ordinis filiformibus et calyce longioribus. Calyx ca. 1 cm. longus et bracteae 1.1

cm. longae. Calyx dimidiam corollam aequans. Corolla 2 cm. longa (in typo corolla multo longior, sub anthesi 4 cm. longa et calyx ca. 1 cm. longus). Petioli 1.5–2.5 cm. longi, lamina 15 × 2.5–3.5 cm. longa et lata, penninervis; nervis secundariis arcuatis 9–11. Inflorescentia 5–6 cm. longa.

Nova Grenada, La Paila (leg. Holton, 6 Jun. 1853) in Herb. N. Y. Bot. Gard. and Kew.

We have compared this plant with specimens from the West Indies and Central America, named by Grisebach *D. secunda*, but it is so different that it may become perhaps practical to consider our variety as a distinct species.

RUBIACEAE

Psychotria pseudocollina Hochr. sp. nov. (e sect. *Eupsychotria* Mull. § *Sphondylothrysae* K. Schum.)

Frutex, rami cylindrici, glabri, virides; novelli compressi. Folia lanceolata, in petiolum longum, interdum tertiam laminae longitudinis partem attingentem, attenuata; lamina ut petioli glabra, apice acuta, margine integra, penninervis, nervis secundariis obliquis, arcuatis, utrinque 6–8; stipulae minimae, coronam brevissimam, scariosam et mox in fragmenta derumpentem efformantes. Inflorescentiae terminales, laxe paniculato-corymbosae, plerumque foliis intermixtae, foliorum superiorum reductorum longitudinem sub anthesi aequantes vel superantes; rami apice verticillos vel glomerulos 3-vel plurifloros gerentes; bracteae minimae, ovato-triangulares, acutae, interdum ± fimbriatae. Hypanthium obconicum, extus glabrum. Calyx cupularis, gamosepalus, ore vix 5-dentatus, fere truncatus. Corolla hypocrateriformis, extus glabra, 5-lobata, lobis ellipticis, apice acutis cucullatis, supra glaberrimis; corollae tubus brevis, intus basi glaber, fauce villosus. Stamina fauce inserta, dorsifixa; antherae lanceolato-lineares, basi longe sagittatae. Discus prominens, calyce fere aequilongus. Stylus cylindricus, glaber, in disci perforatione insertus, apice bilobus, lobis longis, partis styli liberae longitudinem fere aequantibus. Ovarium inferum, 2-loculare, loculis 1-ovulatis. Fructus laevis, globosus, 2-pyrenatus.

Petioli 1–2.5 cm. longi; stipulae ca. ½ mm. longae; lamina 9.5 × 3.1–7.7 × 2.5–5 × 1.7 cm. longa et lata. Inflorescentia 6 × 5.5–10 × 14 cm. longa et lata; bractearum corona vix 1 mm. longa. Hypanthium 1 mm. longum. Calyx 0.5–0.75 mm. longus, ore ca. 1.5 mm. in diam. latus. Corolla tota 2 mm. longa, lobis et tubo ca. 1 mm. longis. Antherae ca. 0.75 mm. longae. Discus 0.5 mm. longus. Stylus 1–0.75 mm. longus; stigmata 0.75 mm. longa. Fructus, quos vidi, ca. 6 × 5 mm. longi et lati.

Nova Caledonia, Wagap (*Vieillard no. 746* [*Depl. 419*]), in Herb. N. Y. Bot. Gard.

This species very much resembles *P. collina* and I thought at first it was a variety. However, by a closer investigation the differences in the habit were found to be followed by differences in the flower, which led me to make a new species. *P. collina* has leaves with 8–10 secondary nerves and a rather dense corymbose inflorescence, while *P. pseudocollina* has larger leaves with 6–8 secondary nerves and a very lax inflorescence. The calyx-lobes are quite distinct and rounded-acuminate in *collina*, but in *pseudocollina* they are hardly to be seen. The corolla of *collina* has lobes which are distinctly pilose on their upper surface, so also is the base of the corolla tube, while *pseudocollina* is quite glabrous with the exception of the throat. The anthers are also much more elongated in our species. All these characters may be seen very well on the excellent plate of Labillardière Sertum Austr. *t. 47*, 1824.

Our plant suggests *P. turbinata* A. Gr., but Gray's plant has shorter inflorescences and its axes are hairy.

Malanea obovata Hochr. sp. nov.

Rami lignosi, teretes, juniores ferrugineo-tomentelli, ramificationes sub angulo fere recto divaricatae. Stipulae ovato-lanceolatae; folia opposita obovata vel obovato-lanceolata, integra, glaberrima, basi in petiolum brevem attenuata, apice acuta vel acuminata, supra in sicco nigrescentia, subtus pallidiora, arcuatim penninervia, nervis secundariis utrinque 7–9. Inflorescentiae apice ramorum confertae, axillares — plerumque duae in axilla, altera longissima folio florifero longior et altera brevior — ± pyramidatim paniculatae, ramosae; flores fere sessiles, subglomerati; inflorescentiae axes ferrugineo-tomentosi, bracteae dentiformes; flores ipsi minimi. Calyx cupuliformis, ore vix 4-angulatus, fere glaber. Corolla brevis, 4-lobata; lobi praefloratione valvati, extus parcissime pilosi, intus medio villis longis crispis praediti. Stamina brevia, juniora tantum vidi. Stylus cylindricus, apice bilobus.

Stipulae deciduae ca. 0.6 cm. longae et 0.3 cm. latae; petioli 0.5–0.6 cm. longi; lamina 4.7 × 1.5–10.3 × 4.2 cm. longa et lata. Inflorescentiae, quas vidi, longiores 9–10 cm. longae, breviores 3–5 cm. longae; longiores in dimidio vel triente superiore tantum ramosae; alabastra matura cum calyce ca. 0.2 cm. longa et 0.75 mm. crassa.

Roraima, Guyana Brit. (*Schomburgk no. 1002*), in Herb. N. Y. Bot. Gard. et Kew.

This species comes next to *M. sarmentosa* Aubl., but differs not only in the ramification, which may vary and which is rather acutely angled in Aublet's plant, but also in the form of the stipules

(1 × 0.4 cm. in *M. sarmentosa*), number of secondary nerves (9–10 in *M. sarmentosa*), length of inflorescence (much shorter than the leaves of *M. sarmentosa*) and in the size of the flowers which are sensibly smaller here. We compared it too with *M. sarmentosa* DC. non Aublet (= *M. glabrescens* Bartl.), but the Candollean plant has wide elliptic leaves (10.5 × 6.5 cm.) and the flower buds are thicker and covered with a dense canescent tomentum, so that the difference between the two plants is very well marked.

This species differs from all Brazilian ones by its quite glabrous leaves.

RANDIA CORYMBOSA Boerlage Handleiding Fl. Ned. Ind. 2^1: 130. 1891

Gynopachys corymbosa Bl. Cat. Gew. Buitenzorg, 48.

In spite of what Mrs. Koorders and Valeton say (in Bijdr. Booms. Java **8**: 88 in Mededeel's L. Plant. 59) this is much different from the type of *Anomanthodia auriculata*, so that their synonymy seems rather doubtful.

The species quoted first, the type of which we had the opportunity to study, resembles more closely *Randia densiflora*, which is considered as a distinct species, than *Anomanthodia auriculata*.

Ixora neocaledonica Hochr. sp. nov.

Rami lignosi. Folia integra, fere sessilia, basi cordata, lanceolato-linearia, ita ut margines e basi lato usque fere ad trientem superiorem parallelae sint; lamina in apicem subacuminatum regulariter attenuata, supra subtusque glaberrima, consistentia subcoriacea, penninervis, nervo medio valde prominente. Inflorescentiae axillares et terminales, in cymas elongatas ± strictas corymbosas dispositae, basi, et bracteis reniformibus pennatinervibus, et saepe foliis reductis ovato-acutatis forma inter folia et bracteas intermediis praeditae. Infrutescentia laxius divaricata. Calyx minimus, dentatus; corollae tubus longus, lobi ovato-lanceolati ± acuti, praefloratione contorti. Stamina 4, corollae fauce inserta, linearia, acuminata, basi dorso filamento brevi affixa. Stylus cylindricus, apice bilobatus. Fructus subglobosus, basi in pedunculum ± attenuatus.

Petiolus ca. 0.5 cm. longus; lamina ca. 17 × 5–19 × 6.5 cm. longa et lata. Inflorescentia ca. 10 cm. longa, pedicellis singulis ad 0.5 cm. longis. Calyx sine ovario ca. 0.075 cm. longus, ore ca. 0.2 cm. in diam. latus. Corollae tubus ca. 1.3 cm. longus, lobis 0.6 cm. longis. Stamina fere 0.4 cm. longa. Fructus subglobosus 0.8 cm. longus, 0.7 cm. latus et 0.7 cm. crassus.

Wagap, Nov-Caledonia (*Vieillard no. 2798*), in Herb. N. Y. Bot. Gard., Paris et Kew.

Resembles very much *I. timorensis* Decsne, the inflorescence of which is nearly identical, but the leaves are attenuate at the base in *I. timorensis*, and the petiole is about 1 cm. long. Our plant must be also closely related to *I. yaouhensis* Schlechter, which differs, however, if we follow the description, in having smaller leaves, a campanulate calyx of 0.25 cm. in length (author says 2.5 cm. long, which may be a misprint for 0.25), acute petals and a longer style. This last difference may be due to the fact that the flowers of our specimens were younger.

Ixora bracteata Hochr. comb. nov.

Charpentiera bracteata Vieillard in Bull. Soc. Linn. de Normandie 9: 346. 1865, sub fam. *Loganiaceae*.

Arbor parva; rami juniores ± angulati, plerumque bilateraliter compressi, glabri. Folia sessilia elliptica, apice obtusa, basi cordata vaginentia, glaberrima, supra nitentia, ramorum apice, in vicinitate florum conspicue minora et breviora. Inflorescentiae terminales, breves, trichotomae, triflorae, inter bracteas duas magnas reniformes sessiles semi-occultatae; flores breviter pedicellati. Calyx vix 4-lobatus, cupularis, minimus. Corollae tubus calyce multoties longior, lobi lanceolato-oblongi ± acuti. Stamina 4, linearia, acutata, fauce corollae inserta, serius inter corollae lobos refracta. Stylus longissimus, apice profunde bilobatus.

Folia ca. 7.5 × 4.2 cm. longa et lata, superiora 4 × 2.2–1.8 × 1.4 cm. longa et lata. Bracteae orbiculares 2.9 × 2.9–2.1 × 2.1 cm. longae et latae. Inflorescentiae pedunculus communis 0.5–1 cm. longus; pedicelli cum calyce 0.3–0.5 cm. longi. Corollae tubus ca. 2.7 cm. longus et vix 0.1 cm. crassus, lobi ca. 0.7 cm. longi et fere 0.4 cm. lati; filamenta ca. 0.1 cm. longa, antherae ca. 0.35 cm. longa, stylus tubi corrolini longitudinem ca. 0.6 cm. excedens. Fructus oblongus ca. 1 cm. longus.

Wagap, Nov. Caledonia (*Vieillard no. 689*), in Herb. N. Y. Bot. Gard. et Paris.

I have not seen the original number quoted by Vieillard, but the description agrees exactly and our plant is identical with *Balansa no. 3410* which bears in the Paris herbarium the name *Charpentiera bracteata*. As the description was very incomplete and not easily accessible I have here inserted a new one. Vieillard placed this plant in the *Loganiaceae* and it was a puzzle until Schumann transferred the genus to the *Rubiaceae;* but I think he was wrong in identifying it with *Pavetta* because it has the characteristic deeply bilobed stigma of *Ixora*.

CANDOLLEACEAE

Stylidium minor Hochr. comb. nov.

Ventenatia minor Smith Exot. Bot. **2**: 15, *t. 67*. 1805.

Stylidium lineare Swartz in Gesell. Naturforsch. Fr. Berl. Mag. **1**: 50, *t. 1*, *f. 1*. 1807; DC. Prod. **7**: 333; Benth. Fl. Austr. **4**: 11.

Stylidium planifolium Poir. Dict. Supp. **5**: 412. 1817.

New South Wales (U. S. S. Pacif. Exp. Exp., *Wilkes no. 29*), in Herb. N. Y. Bot. Gard.

COMPOSITAE

EUPATORIUM AMPHIDICTYUM DC. Prod. **5**: 163. 1836;
Baker in Mart. Fl. Brasil. **6**^{2}: 309

Bulbostylis pumila Gardn. in Hook. Lond. Journ. Bot. **5**: 470. 1842.

Under the name *E. amphidictyum* Baker quotes in Mart. *loc. cit.*, a plant of *Martius no. 830*, in the Kew Herbarium, that that plant is considered as the true *E. amphidictyum*. In the New York Herrium the same plant of Martius occurs and bears the same number, therefore we thought it also should be *E. amphidictyum*. But after comparing it with the type of the *Prodromus* it proved to be quite different, the plant of de Candolle having much larger leaves and a long nude peduncle, bearing only a few minute bracts and at the top a small number of heads crowded together with short pedicels. Those heads are much larger than the ones of our plant.

Unfortunately the state of our specimen does not allow us to make a complete description of it, but there is no doubt that if it is a *Eupatorium* it is a new species. We are not yet convinced that it belongs to that genus, however, and the arrangement of the heads at the ends of the inflorescence branches suggests certain species of *Vernonia*. Having no good flowers we find it advisable to leave aside such a plant, wishing only to point out that *Martius no. 830* of the New York, as well as of the Kew, Herbarium has nothing to do with the type of de Candolle's *E. amphidictyum*.

Baccharis subsculpta Hochr. sp. nov. (e sect.
Oblongifoliae Baker)

Suffructicosa. Caules striati, minute glanduloso-puberuli, novelli subangulati. Folia spiraliter disposita, oblonga vel ovato-oblonga (novissima oblongo-linearia), basi angustata sessilia, apice acuta,

margine parte inferiore subintegra, parte superiore irregulariter dentata, dentibus acuminatis vel acutissimis; lamina fere glabra, irregulariter penninervis et reticulato-bulbulata; nervis supra immersis, subtus valde prominentibus. Inflorescentia terminalis, thyrsoideo-corymbosa, ca. quam vidi, 13 capitula gerens; pedunculi et pedicelli glanduloso-tomentelli. Capitula majora polygama (qua vidi ♂ vel ☿ sterilia) involucri bracteae pauci-seriatae, lanceolato-lineares, longe acuminatae, interiores scariosae, exteriores marginis parte superiore fimbriatae et dorso parce glanduloso-puberulae. Corolla lutea, glabra, tubulosa, dimidio superiore infundibuliformi-dilatata, parte dilatata ultra medium 5 lobata; lobis triangularibus. Stamina 5, antherae lineares, apice longe acuminatae. Stylus et stigma *Asterearum*. Achenia sterilia tantum vidi, pappo pallido stramineo coronata. Pappi setae plerumque irregulariter undulatae, rugosae, apice aliquantulum dilatatae et ibidem pilosae, quam corolla distincte majores.

Folia 6 × 2–7 × 2–5.2 × 1.5 cm. longa et lata, novissima ad 2.2 × 0.6 cm. longa et lata, dentibus ad 0.2 cm. longis; internodia 2.5–1.5 cm. longa. Inflorescentia ca. 6 × 4 cm. longa et lata. Capitula 1–1.4 cm. in diam. lata. Corolla ca. 0.4 cm. longa, i. e. tubus 0.2 cm. longus, et lobi ca. 0.15 cm. longi. Pappi setae ca. 0.5 cm. longae; achaenium sterile ca. 1 mm. longum.

In Peruvia interiore (*Matthews no. 564*), in Herb. N. Y. Bot. Gard.; idem in Herb. Kew sub (*Matthews no. 758*), Cuesta of Perruchuca.

This *Baccharis* is very near *B. sculpta* Griseb. from Argentine. The latter differs, however, by its rather flat corymb, its flat leaves with wider teeth, by the wider and rather whitish involucral bracts and by the smaller heads. Our species suggests also *B. sphaerocephala* which differs also by its larger heads (up to 1.8 cm. in diam.), its non-alveolate leaves, and the flat corymb. Following the description our plant is related to *B. grandicapitulata* Hieron., but differs by its larger and acute leaves and by its pappus much exceeding the crown.

HELICHRYSUM ARMENIUM DC. Prod. 6: 183; Boiss.
Fl. Or. 3: 235

Gnaphalium armenium Fischer et Mey.

Var. glanduliferum Hochr. comb. nov.

= *H. glanduliferum* Schultz-Bip in Kotschy exsicc. Pl. Alepp. Kurd. moss. no. 310, leg. 24 Jun. 1841.

A typo differt caulibus crassioribus rectis (in typo caules sinuosi teneri), foliis oblongis, vel oblongo-lanceolatis, sessilibus, basi

auriculato-decurrentibus ± 3 × 0.7 cm. longis et latis, supremis ± ovatis 2.5 × 0.45–1.5 × 0.25 cm. longis et latis (in typo folia anguste linearia 2.8 × 0.15 cm. longa et lata, folia inferiora interdum ± spathulata 4 × 0.35 cm. longa et lata), foliis et caulibus glanduloso-pilosis, fere non lanatis (in typo folia et caules floccoso-lanata, nec glandulosa), denique differt capitulis paulo majoribus, 6–7 mm. in diam. latis (capitula in typo 4.5 mm. lata).

Koordistan (*Grant & Hinsdale no. 55*), Herb. N. Y. Bot. Gard.

At first sight anyone might think that *H. armenium* and *H. glanduliferum* were two different species; but the numerous plants referred to *H. armenium* by Boissier show such a variation that we understand very well why he considered the whole lot as a polymorphic but unique species.

However, as may be seen by the description, this particular form, called *glanduliferum* by Schultz seems so well characterized by its glands and the form of leaves and indumentum, that it is practical to keep it apart as a variety. The specimen of the New York Herbarium is absolutely identical with the form of Schultz.

The type of *H. armenium* DC. is *Gnaphalium armenium* Fisch. et Mey., founded upon a plant of Szowitz, a specimen of which is in Herb. Boissier. From that plant I took the indications concerning the *forma typica* of the species.

LAGASCEA HELIANTHIFOLIA H.B.K. Nov. Gen. Am. 4: 24; DC. Prod. 5: 92

Orizaba (*Muller, no. 1273*), in Herb. N. Y. Bot. Gard.

L. helianthifolia differs certainly from *L. latifolia* DC. as may be seen in the originals. The leaves of *L. latifolia* DC. are scabrous beneath, while those of *helianthifolia* are softly tomentose.

On the other hand *L. latifolia* = *L. suaveolens* H.B.K.; DC., therefore it is an error to consider *L. suaveolens* and *L. helianthifolia* as synonyms, as English authors do, for instance in Ind. Kew.

Viguiera Brittonii Hochr. sp. nov.

Prob. suffrutex. Caules hirsuti, scaberrimi, apice ramosi. Folia spiraliter disposita, interdum folia minora in ramis secundariis opposita, omnia sessilia; lamina pergamentacea, ovato-lanceolata, basi rotundata vel quasi in petiolum alatum brevem abrupte angustata, apice longe attenuata, acuminata, acutissima, margine plerumque aliquantulum recurvata, minute et distanter dentata; lamina tripli- vel interdum quintupli-nervis, supra saturate viridis, pilorum deciduorum basibus persistentibus scaberrima, subtus in sicco laete viridis

et villis ± adpressis, albis, mollibus, pilosa, sed in nervaturis scabra. Capitula terminalia et in foliis superioribus axillaria, corymbum pauciflorum aemulantia. Pedunculi scaberrimi et parte superiore insuper hirsuto-villosi; involucri bracteae pluriseriatae, lanceolatae, extus praecipue in lateribus dense canescenti-villosae, nec scabrae, extimae angustiores, apice acuminato-acutae, intimae latiores, apice attenuato-acutae et etiam rotundatae mucronatae, omnes praeter apicem interdum minute pilosum intus glabrae. Radii flores steriles ligulati ± 15; ligula oblonga, apice rotundata vel retusa, extus praecipue basi minute et parce pilosa, paleae lanceolatae glabrae, ± circum florem plicatae, ca. 12-nerviae. Flores tubulosi, paleis vix aequilongi; corolla apice 5-lobata, extus minute pilosa. Stamina 5, antherae lineares. Stylus helianthoidearum, breviter bilobatus. Achaenia aliquantulum complanata, pilosa, apice aristis duabus inaequilongis et squamis duabus latissimis apice truncatis, fimbriatis, coronam aemulantibus, sed cum aristis nunquam concrescentibus, praedita; aristae squamis triplo vel quadruplo longiores sed quam corolla breviores.

Folia 7.2 × 2–5 × 1.3 cm. longa et lata. Folia superiora minora subopposita ca. 1.5 × 0.35 cm. longa et lata. Pedunculi ad 6 cm. longi, sed interdum rami axillares fere usque ad capitulum terminale parce foliati. Capitula, radio excepto ca. 1.5 cm. in diam. lata; bracteae exteriores ca. 0.5 × 0.2 cm. longae et latae, interiores ca. 0.8 × 0.3 cm. longae et latae. Paleae ca. 0.7 cm. longae. Radii ligulae ca. 0.9 × 0.4 cm. longae et latae. Flosculorum corolla ca. 0.45 cm. longa. Achaenium immaturum 0.175 cm. longum. Pappi aristae 0.2–0.3 cm. longae; squamae ca. 0.5 mm. longae et tam latae quam achaenium latum.

Peruvia (*Matthews*, anno 1862, *no. 12*) in Herb. N. Y. Bot. Gard. (*Matthews sine no.*) in Herb. Kew sub nomine *Harpalium truxillense.*

This species does not resemble any other except *V. Scyszylowiczii* Hieron. which I have not seen, but which must be very closely related to our plant, if we follow the description. However, the characters given by Prof. Hieronymus and not agreeing with our species are the following: (1) "Involucri squamae interiores 11–12 mm. (the text bears *cm.* which must be a misprint for mm.) longae acutae glanduloso-punctulatae," while ours do not exceed 8 mm., are never glandulose and the inner ones are rounded at the apex. (2) "Paleis 9-nerviis, in juventute pilosulis." Ours are glabrous and 12-nerved. (3) "Ligulae ca. 21 × 5 mm. longae et latae." Ours are about 9 × 4 mm. (4) "Pappus squamulis 7–8, apice laciniato-dendatis, aristaque unica formatus." Ours is composed of 2 spines and 2 truncate scales. (5) "Corolla disci ca. 6 mm.," while ours does not exceed 4.5 mm.

All those characters show that Hieronymus's plant must have more or less the same habit, but larger flowers and a different organization of the pappus.

Helianthus Matthewsii Hochr. sp. nov.

Prob. suffrutex. Caulis minute striatus et parce canescenti-tomentellus, cylindricus, non vel ramorum apice tantum aliquantulum scaber. Folia petiolata, spiraliter disposita, sed probabiliter basi ramorum opposita, *quia* in ramulo accessorio folia inferiora opposita vidi; petioli adpresse canescenti-villosi; lamina lanceolata, vel ovato-lanceolata, basi in petiolum attenuata, margine subintegra, apice attenuato-acuminata acuta, supra pilis parvis tuberculatis induta, subscabra, saturate viridis, subtus pilis adpressis longis lanatis canescenti-tomentosa; lamina nervis secundariis duobus, fere basilaribus, dimidiam longitudinem attingentibus, trinervia; nervis, supra ± impressis et parum conspicuis, subtus prominentibus et dense canescenti-tomentosis. Inflorescentia ± corymbosa; rami elongati in foliorum reductorum alternorum vel superne bractearum subulatarum axillis nascentes; pedunculi densius canescenti-pilosi, subscabri. Capitula pro rata parva; involucri bracteae exteriores lanceolatae, virides, adpresse et parce canescenti-villosae, margine, versus apicem, ut interiores, ciliatae. Radii flores neutri, ligulati; tubus et ligula extus minutissime pilosa; thalamus paleaceus, paleis lanceolatis, praecipue exterioribus circum flores conduplicatis, apice ± pilosis; disci flores tubulosi, tubus parte inferiore angustior, parte superiore parum latior sed cylindricus, extus minute pilosus, apice tantum modice 5-lobatus, lobis parvis, ovatis. Stamina 5; antherae apice connectivi parte lanceolata praeditae. Stylus cylindricus, apice bifidus, lobis truncatis. Achaenia nigra, interdum glaberrima, interdum (ea florum interiorum) adpresse pilosa; achaenia exteriora minus, interiora plus, antice compressa. Pappus praeter aristam unam vel duas tenuissimas caducissimas, nullus.

Caulis 0.15–0.3 cm. crassus. Foliorum adultorum petioli 0.5–0.7 cm. longi; laminae, quas vidi, adultae 9 × 2.1–7 × 1.8 cm. longae et latae, minores 3 × 0.9 cm. longae et latae. Capitulorum pedunculi 0.5–3.5 cm. longi. Capituli discus 0.8–1.3 cm. in diam. latus. Involucri bracteae exteriores ad 0.9 cm. longae et 0.15 cm. latae; paleae ca. 0.4 cm. longae. Flores ligulati cum ligula et achaenio sterili 1–1.2 cm. longi; florum tubulosorum corolla ca. 0.4 cm. longa. Achaenia submatura 0.2–0.25 cm. longa et 0.1 cm. lata.

Peruvia (Matthews an. 1862) in Herb. N. Y. Bot. Gard.; id. in Herb. Kew ex Peruvia Chachapoyas (*Matthews no. 3061*).

There is no doubt that the two plants are two specimens of the same collection, so that we may consider them as coming from the same locality and bearing the same number. The Kew specimen

is to be found under *Viguiera*, but the absence of scales at the apex of the achene shows that it is a *Helianthus*.

It is true that the achenes of the center of the heads are generally covered with bristly hairs and, at the apex, those hairs, exceeding a little the length of the fruit, may look like a very reduced pappus. But where the very caducous lateral bristles are preserved, one may see very distinctly that those bristles alone form the pappus. In that case, if hairs are developed on the fruit, it is obvious that they are inserted on the outer wall of the achenes. It is very interesting to note that in the same head some achenes are quite glabrous and some others are covered with bristly adpressed hairs.

Our plant resembles *H. cornifolius* and *aureus* H.B.K., with the original of which we compared it in Paris, but *H. cornifolius* differs by its hirsute stems and wider and very scabrous leaves. *H. aureus* differs also by its oblong leaves and larger heads with ligulate flowers attaining 3 × 0.5 cm. length and width.

The *Viguieras* being very near allies of *Helianthus* we wish to note also the species of that genus most resembling our plant. These are only *Viguiera dentata* Spreng. from Guatemala or *V. decurrens* and *helianthoides* from North America. But all of them are quite distinct.

Lipochaeta lifuana Hochr. sp. nov.

Prob. suffrutex, totus adpresse viloso-argenteus. Caules obscure tetragoni, praecipue apice dense villosi. Folia opposita, valde variabilia, a lanceolato-oblonga ad anguste lanceolato-linearia, basi in petiolum attenuata, margine integra, supra plana, subtus obscure elevato-venosa, basi trinervia, apice contracto-obtusa. Capitula solitaria, ramorum apice congesta, subterminalia, longe pedunculata; pedunculus folia fere aequans vel conspicua longior; involucri bracteae variabiles a lanceolatae ad late ovato-lanceolatae, acutatae, nunquam acuminatae, ut pedunculi et planta tota extus adpresse villosae. Thalamus fere planus; radii flores ± 51–16, luteae, ligulatae; disci flores tubulosi, 5-lobati, loborum margine aliquantulum incrassato; paleae rigidae, lineares, acutae, dorso, praecipue medio et apice villosae. Achaenia eis *Lipochaetae integrifoliae* Gray, simillima, compressa, angulata, apice truncata et villosa. Fructus maturos non vidi.

Petioli 0.3–0.7 cm. longi, lamina 2.8 × 1–2.7 × 0.7–2.2 × 0.35–1.5 × 0.4 cm. longa et lata. Pedunculi uni capitati 2–3 cm. longi. Capitula cum bracteis, praeter radium ca. 1 cm. in diametro lata; flores ligulati ca. 1–0.8 cm. longi, flores tubulosi cum achaenio ca. 0.6 cm. longi; bracteae exteriores ca. 0.4 × 0.3–0.5 × vix 0.2 cm. olngae et latae; paleae ca. 0.55 cm. longae.

Ins. Lifu, Nova Caledonia (*Vieillard no. 799*), in Herb. N. Y. Bot. Gard., Paris et Kew.

I first named this plant *Weddelia lifuana* (cf. Kew in Herb.) but the fruit, with its sharp edges and villous apex, is so exactly similar to the one of *Lipochaeta integrifolia* Gray, that I must place our plant next to it. The base of the leaves of *L. lifuana* shows also the three main nerves characteristic of the genus. However, *Weddelia* and *Lipochaeta* are very nearly related.

The New York specimens show the two extreme shapes of leaves and bracts, the narrowest and the widest, but the Kew ones show all intermediate links, so that we cannot but consider them forms of the same species.

Calea umbellulata Hochr. sp. nov. (e sect. *Leontophthalmum* Baker)

Verisimiliter herba vel suffrutex bi-tri-chotome ramosus. Caulis cylindricus, parce et minute pilosus, in nodis villosus. Folia opposita, ovata; petioli villosi; lamina basi rotundata, interdum in petiolum brevissime attenuata et versus apicem acutata sed non acuta, margine integra vel dentibus paucis repando-dentata, 3-nervia et retinervis, nervis supra impressis, subtus prominentibus; lamina supra subtusque scabra. Inflorescentiae axillares et terminales umbellatae, longe pedunculatae, interdum pedunculi communis apice umbellulae plures pedicellatae dispositae; umbellae 1–3 in axilla; umbellae vel umbellulae basi foliis duobus reductis involucratae; pedunculi et pedicelli glanduloso-hirtelli. Capitula oblonga, breviter pedicellata; involucri bracteae oblongae, multiseriatae, imbricatae, dorso glabrae vel parce hirtellae, apice plerumque rotundatae vel subacutae. Thalamus paleaceus; paleae scariosae, lanceolato-subulatae, achaeniis longiores. Flores tubulosi 6–9, apice 5-lobati: tubus parte inferiore ad filamentorum insertionem abrupte angustatus. Stamina 5, filamenta pro rata longa, antherae vix hastatae. Stylus bilobatus, apice truncatus. Achaenia oblonga, laevia, glabra, vix compressa, ± nigrescentia cum matura, apice pappo paleaceo coronata; setis lanceolato-subulatis, longe acuminatis, flore aequilongis.

Caules, quos vidi, ad 40 cm. longi. Folia inferiora: petiolus ca. 2 cm. longus, lamina 9 × 5.5 cm. longa et lata; folia superiora: petiolus 0.3–1 cm. longus, lamina 4.8 × 2.6–2 × 0.9 cm. longa et lata. Pedunculi 1.5–4 cm. longi, pedicelli 0.2–0.5 cm. longi. Capitula ad 0.6 cm. longa et 0.3–0.5 cm. lata. Achaenium 0.15 cm. longum et 0.075 cm. latum; papi setae 0.4 cm. longae.

Peruvia (Matthews an. 1862), in Herb. N. Y. Bot. Gard. Peruvia Chachapoyas (Matthews in Herb. Kew).

This species is certainly allied to *C. Ottonis* Sch. Bip., which has the same inflorescence; but *C. Ottonis* differs by its hairy akenes and by its leaves being shorter, wider and much more hairy beneath. Our species is also related to *C. Zacatechichi* Schlecht. and *salmaefolia* Hemsl., but both have hairy fruits and short, truncate pappus.

SENECIO LEUCOPHYTON Philippi in Linnaea 28: 738. 1856

Chile prov. Colchagua (*Bridges vel Cuming no. 181*) in Herb. N. Y. Bot. Gard.

The specimen of the New York herbarium is exactly the same as the type of Germain, upon which Philippi founded his species. It is very distinct from *S. argenteus* Remy and *S. chilenis* Lessing by its glabrous fruits and also by a slight difference in the tomentum, which looks like thin paper on *S. argenteus* and *chilensis*, while it is here rather like wool or cotton-wool. However later on Philippi omitted our species in his list of Plant. Neuv. Chilenas. It must have been forgotten.

S. argyreus with smooth achenes is quite a different plant, with large leafy stems, much larger heads and a yellowish tomentum.

A Phytogeographic and Taxonomic Study of the Southern California Trees and Shrubs

By LeRoy Abrams

CONTENTS

PAGE
Preface........ 300
Introduction........ 301
  Physiography........ 301
  Climatology........ 304
    General description........ 304
    Temperature and rainfall records........ 305
Phytogeographic features........ 307
  General description........ 307
  Boreal region........ 308
    General description........ 308
    Canadian zone........ 308
  Austral region........ 310
    General description........ 310
    Transition zone........ 310
    Upper austral zone........ 312
      General description........ 312
      Coastal slope........ 312
      Desert slopes........ 317
    Lower austral zone........ 318
      General description........ 318
      Interior valleys........ 319
      San Diego district........ 319
      Mohave desert........ 320
      Colorado desert........ 321
  Explanation of plates........ 322
Annotated catalogue of the southern California trees and shrubs........ 323

PREFACE

In the study of the trees and shrubs of southern California I have endeavored to discuss the phytogeographic as well as the taxonomic features, as trees and shrubs, being long-lived and non-migratory, furnish excellent material for phytogeographic observations. The present paper is the result of field studies carried on along these lines for a number of years, together with an examination of specimens in the principal herbaria of the United States.

Many helpful suggestions in the study of the phytogeographical problems have been obtained from Coville's "Botany of the Death Valley Expedition," Parish's "Sketch of the Flora of Southern California," and Hall's "Survey of San Jacinto Mountain," as well as from Merriam's paper dealing with his system of life zones, which latter I have adopted.

Acknowledgments are most heartily given to the following persons for the loan of material, or for assistance in determining questions of taxonomy and nomenclature: Dr. B. L. Robinson, Mr. F. V. Coville, Dr. J. N. Rose, Dr. J. K. Small, Dr. P. A. Rydberg, Dr. H. M. Hall, Mr. S. B. Parish, Dr. A. Davidson, Mr. W. F. Wight, Mr. C. R. Ball, Mr. P. L. Ricker, Mrs. K. Brandegee and Miss M. A. Day.

To Professor W. R. Dudley, who has courteously given much time and valuable assistance, and through whose advice and encouragement I undertook the study of the southern California flora, and to Dr. N. L. Britton, who has given valuable aid in carrying on these studies, is due whatever merit this paper may possess.

INTRODUCTION

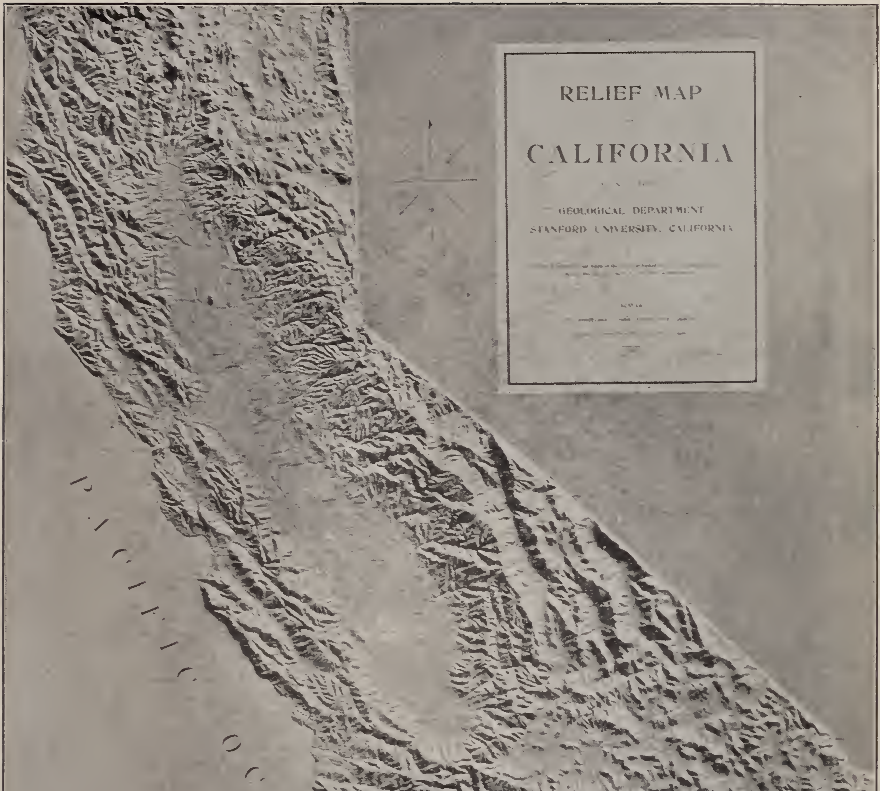
PHYSIOGRAPHY

Southern California is the name popularly applied to that part of the State of California which lies south of Point Conception and the Tehachapi Mountains, a territory lying between 32° 35′ and 35° 45′ north latitude, and extending from the 37th to the 43d meridian west. Its western boundary is the Pacific Ocean, its southern Lower California, and its eastern the Colorado River, which separates it from Arizona. On the north the boundary is formed by the crosss ranges which break up the general trend of the Coast Ranges and the Sierra Nevada. Its line extends from Point Conception eastward along the Santa Ynez Mountains, Mount Pinos, and the Tehachapi Mountains to the southern extremity of the Sierra Nevada, thence eastward to the southern boundary of Nevada. East of the Sierra Nevada the northern boundary is arbitrary, as the Mohave Desert merges into the desert regions northward and eastward with no definite line of demarcation.

The area comprised within these boundaries is approximately 113,250 square kilometers, a little over one fourth that of the entire State. The greatest width from east to west is 520 kilometers, and from north to south 350 kilometers. Southern California covers an area somewhat greater than the entire State of Pennsylvania. If placed on the northern Atlantic coast it would extend east and west from Boston to Buffalo, and southward as far as Philadelphia.

The topography is broken and irregular, with numerous mountain ranges separated by narrow passes or valleys of greater or less extent. The main axis of these mountains lies generally parallel with the coast at a distance of 40 to 120 kilometers inland. At intervals of 60 to 100 kilometers narrow passes divide this axis into several rather distinct sections. Of these sections the northernmost, which lies between Tejon and Soledad Passes, is composed of a series of comparatively low, chaparral-covered mountains, the culminating peak of which (Liebre Mountain) is only 1737 meters above the sea. South of Soledad Pass, between it and Cajon Pass, are the rugged peaks of the San Gabriel Mountains, which rise abruptly out of the coastal valleys to altitudes ranging from 1800 to over 3000 meters (Mount San Antonio = 3024 meters). The San Bernardino Mountains, although less broken and irregular, reach even higher altitudes. In this range, which is separated by the narrow Cajon Pass from the San Gabriel Mountains, is the highest mountain south of the Sierra Nevada (San Gorgonio, 3428 meters). Extending southeastward from Mount San Gorgonio, at a much lower altitude, are the desert ranges, the Cottonwood and the Chuckawalla Mountains, which separate the Mohave and the Colorado Deserts. To the southward, again, between the Colorado Desert and the coastal region, rise the San Jacinto Mountains. The eastern base of Mount San Jacinto, the highest peak in this range, rests almost directly upon the low depressions of the Colorado Desert (Palm Springs, altitude 137 meters) while its summit, scarcely eight miles distant in an air line, rises with an almost sheer ascent to 3242 meters. South of the San Jacinto Mountains are the less rugged Palomar, Santa Rosa, and Cuiamaca Mountains. This series of mountain ranges divides the deserts from the coastal region, and is one of the principal factors which influence the climate of southern California.

The arid desert country east of the mountains, comprising over one half the entire area of southern California, is separated by the Cottonwood and Chuckawalla Mountains into two distinct divisions, the Mohave and the Colorado Deserts.



RELIEF MAP OF CALIFORNIA.

The Mohave Desert, which lies to the north of the dividing ranges, is triangular in outline and covers an area of approximately 51,200 square kilometers. It is chiefly an arid plateau with an elevation of 300 to 900 meters, but north of our limits is the low depression of Death Valley which is nearly 90 meters below sea level. The broad level expanse is broken here and there by short isolated ranges or "lone mountains," the rocky barren slopes of which, save for their talus bases, rise abruptly from the floor-like plain. Between these elevations are numerous low depressions which have become sinks or "dry lakes." The surfaces of these are frequently crusted over with the deposits of soluble salts, and the margins lined with characteristic saline vegetation.

To the south of the Cottonwood and the Chuckawalla Mountains lies the Colorado Desert, which extends southward along the gulf slope of Lower California, and eastward into southern Arizona and northwestern Sonora. Within the boundaries of California this desert, the area of which occupies a little over 16,000 square kilometers, is principally the dry bed of a large inland sea or lake, with pebble-covered beaches that are still clearly discernible along the base of the surrounding mountains. At one time this depression was a continuation of the Gulf of California, from which it was cut off in comparatively recent times. This separation was accomplished partly, perhaps, by a slight elevation of the land between the vicinity of Yuma and the Cocopa Mountains, but chiefly by the delta formed at the mouth of the Colorado River, which latter carries great quantities of silt. Inward from the gravelly rim of the depression the character of the soil gradually changes from a sandy loam into the heaviest of clays, while the center, now covered by an accidental overflow from the Colorado River, is normally a salt bed several feet in thickness.

On the western or coastal side of the mountains the foot-hills and mountains give way here and there to valleys often of considerable extent. These valleys are mainly very fertile, supporting a luxuriant vegetation wherever water is plentiful, but areas of low alkaline soil, or dry gravelly mesas or washes are frequently interspersed. Along the southern base of the San Gabriel and the San Bernardino Mountains the original floor of the valley has been buried by debris of gravel and coarse sands, washed down by the winter torrents from the steep mountain slopes. Here and there, however, isolated hills or elevated mesas, projecting above the talus, remain as indicators of the original sedimentary deposits. This large interior valley is separated from the low valley along the coast of Los Angeles and Orange Counties by the Santa Ana Mountains, and a series of low hills which connect them with the Santa Monica Mountains. North of this last range is the low coastal valley of Ventura County, the only other valley of any considerable area on the western side of the mountains.

CLIMATOLOGY

General Description

There is great diversity of climate, due principally to topography, a factor which exerts a marked influence in southern California, since the principal mountain ranges lie transversely to the path of the prevailing winds and storms. As a rule, however, the climate is one of scant precipitation and high temperatures, conditions that become more and more pronounced toward the interior, away from the ameliorating influences of the cool moist sea-breeze. The rainfall is chiefly confined to the winter and early spring months, the dry summer and autumn having almost continual sunshine. Precipitation is greatest in the mountains, with an average annual rainfall in some localities exceeding 100 centimeters, and least in the Colorado Desert, where it is less than 5 centimeters in some sections. Fully as great extremes are found in temperatures. On a winter day, for instance, one may stand among blooming roses or in orange groves laden with ripe fruit, and watch the snow, driven by piercing winds, drifting about the rugged peaks of the neighboring mountains.

The following temperature and rainfall records have been compiled from McAdie's "Climatology of California":

TEMPERATURE AND RAINFALL RECORDS

NORMAL MONTHLY AND ANNUAL TEMPERATURE RECORDS, EXPRESSED IN DEGREES FAHRENHEIT

Station.	Altitude in feet	Length of records in years	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Anaheim........	134	23	54.8	56.2	59.2	62.8	66.7	69.8	72.4	73.3	71.9	66.6	61.1	56.9	64.3
Cabazon........	1779	5	51.0	54.7	56.1	62.2	65.0	75.6	82.9	79.1	75.5	67.5	62.6	54.0	65.7
Claremont	1200	9	49.7	51.6	53.0	57.1	60.7	66.7	71.6	70.6	69.2	62.4	57.3	51.6	60.1
Colton..........	965	24	50.6	53.2	57.1	61.4	67.5	73.2	78.5	78.9	73.8	64.8	57.5	53.0	64.0
Elsinore	1234	6	50.3	53.0	56.3	61.7	66.0	71.5	78.4	77.1	74.2	65.6	59.2	52.6	63.8
Escondido.......	650	7	49.6	52.0	54.3	58.3	62.6	67.9	72.5	72.1	69.0	61.5	55.1	49.5	60.3
Fernando	1066	23	50.5	53.0	56.3	61.1	64.7	70.1	74.7	75.4	72.0	65.0	59.2	54.0	63.0
Indio	−20	23	52.9	58.7	65.3	72.5	80.1	88.3	94.5	93.0	86.5	75.4	62.6	56.6	73.7
Manzana	2850	7	42.4	44.6	47.5	54.9	61.2	72.3	80.1	78.4	71.2	60.1	51.1	43.4	58.9
Mohave	2751	24	45.3	48.8	53.5	59.7	68.0	77.5	85.7	84.2	73.9	65.6	54.8	46.8	64.0
Needles.........	491	9	52.4	57.8	64.8	72.2	80.2	87.8	94.4	92.3	84.7	72.2	60.1	52.8	72.6
Newhall	1200	24	47.9	50.2	54.1	58.9	64.1	70.7	76.6	77.3	71.5	62.1	54.8	49.5	61.5
Palm Springs....	584	12	55.3	58.7	65.1	74.6	81.1	90.6	97.7	93.2	85.2	74.5	65.1	55.1	74.7
Poway.........	460	17	48.0	49.5	52.4	55.8	60.6	65.1	68.9	69.6	65.9	59.4	53.5	51.1	58.3
Redlands	1335	8	50.8	52.2	54.7	61.1	65.8	73.8	78.3	77.5	72.1	65.0	58.9	53.2	63.5
Riverside	1025	19	51.1	52.7	55.9	60.4	65.2	70.6	76.3	76.4	72.1	64.2	58.2	53.4	62.9
Salton	−263	12	55.7	58.8	66.0	76.5	83.1	93.8	98.9	97.2	91.0	79.1	66.8	56.1	76.9
San Jacinto	1500	8	49.2	51.3	53.5	57.3	64.5	70.2	76.2	76.0	70.6	62.2	56.1	50.0	60.2
Santa Ana	137	12	55.5	57.5	60.2	64.2	68.8	72.2	75.0	75.4	73.3	68.4	61.8	57.5	65.8
Santa Barbara...	130	17	53.2	54.8	55.4	58.4	60.2	63.2	65.1	66.9	65.7	62.6	59.1	55.7	59.9
Santa Monica ...	92	16	54.2	54.6	57.8	61.3	64.4	66.9	69.9	70.3	67.8	64.8	60.2	57.0	62.5
Santa Paula.....	286	12	52.4	54.0	55.8	60.5	63.4	65.6	68.5	68.4	66.3	62.5	59.8	55.6	61.1
Tehachapi	3964	24	38.2	39.3	44.1	50.2	59.2	69.4	76.4	74.5	66.1	56.1	46.5	39.5	54.9
Ventura	50	8	52.8	53.2	53.6	56.0	58.6	62.1	63.5	64.6	61.4	60.1	57.2	54.9	58.2

MEAN MONTHLY AND ANNUAL RAINFALL RECORDS, EXPRESSED IN INCHES

Station.	Altitude in feet	Length of records in years	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Anaheim........	134	23	2.15	2.18	2.24	.71	.36	.08	T	T	.06	.49	.94	2.32	11.53
Campo	2543	18	2.42	4.74	2.37	1.90	.96	.15	.53	1.86	.25	.46	1.57	2.59	19.80
Colton..........	965	24	1.83	1.97	1.91	.95	.52	.07	.03	.02	.05	.43	.93	1.74	10.47
Cuiamaca.......	4800	4	4.98	4.43	5.33	1.45	1.88	.36	.37	.31	.54	2.25	3.87	4.21	29.98
Descanso	3500	5	4.24	3.45	3.79	1.21	1.40	.01	.20	.57	.17	1.48	1.75	1.28	19.55
Fallbrook	700	25	3.50	3.33	2.98	1.28	.64	.12	.02	.05	.11	.74	1.49	3.06	17.30
Fernando	1066	23	2.49	2.55	2.69	1.05	.44	.12	.02	.04	.04	.73	1.31	2.69	14.19
Holcomb Creek .	5220	5	3.68	1.85	2.79	.60	.60	.05	.00	.28	.10	1.26	1.13	.90	13.24
Indio...........	−20	23	.87	.35	.20	.04	.03	T	T	.14	.11	.08	.19	.41	2.43
Little Bear Valley	5150	7	5.08	2.97	5.38	1.17	1.86	.08	.01	.10	.44	1.36	1.33	5.57	23.35
Los Angeles	294	24	2.80	2.82	2.72	1.10	.51	.10	.02	.04	.04	.81	1.47	3.28	15.71
Mammoth Tank .	257	23	.17	.35	.19	.06	.02	T	.06	.23	.05	.12	.14	.40	1.81
Manzana	2870	7	1.54	.50	1.13	.17	.15	.03	T	.21	.08	.37	.58	.88	5.65
Mohave	2751	24	.90	.84	.71	.16	.04	.05	.08	.04	.07	.25	.30	1.26	4.79
Morse's House...	5350	7	7.77	5.57	8.22	2.26	3.34	.25	.02	.30	.33	2.03	1.93	8.41	40.43
Mount Lowe	3300	8	3.53	2.45	3.74	1.17	1.86	.18	.03	.02	.10	1.90	3.40	.83	19.21
Mutau Flat	4850		4.59	1.30	2.17	.77	.59	.00	.08	.00	.25	1.28	1.12	2.01	14.16
Needles.........	477	9	.61	.16	.21	.04	.11	.02	.42	.22	.11	.10	.24	.55	2.79
Newhall	1200	24	2.54	2.88	2.81	1.03	.51	.08	T	.03	.06	.72	1.56	3.40	15.62
Ogilby..........	354	11	.21	.26	.14	.00	.05	.00	.09	.05	.10	.01	.04	.15	1.10
Palm Springs....	584	12	.74	.66	.35	T	.02	.00	.03	.19	.05	.15	.29	1.20	3.53
Pasadena	828	8	3.65	1.36	3.14	.27	.54	.09	T	.01	.11	.98	1.58	2.09	13.83
Pomona	860	7	3.61	1.32	2.33	.29	.65	.10	.01	.00	.09	.74	1.80	1.88	12.83
Poway..........	460	17	3.11	2.02	2.40	1.37	.54	.09	T	.02	.05	.54	1.16	1.99	13.29
Redlands	1352	12	2.59	2.67	2.63	.55	.76	.10	.04	.52	.37	.68	.94	2.86	14.70
Salton..........	−263	12	.43	.62	.21	T	.07	.19	.14	.13	.12	.12	.55	.55	2.56
San Bernardino .	1048	29	3.32	2.95	2.53	1.22	.58	.08	.03	.19	.12	.60	1.29	2.99	15.59
San Diego.......	100	52	1.75	1.91	1.37	.64	.34	.07	.05	.11	.07	.33	.96	1.97	9.52
Santa Ana	137	12	2.34	2.09	2.24	.32	.37	.05	.00	.06	.07	.74	.74	2.45	11.46
Santa Barbara...	130	33	3.68	3.12	2.26	1.18	.40	.11	.02	.04	.22	.77	1.61	3.23	16.59
Santa Paula.....	286	12	3.06	2.07	3.07	.37	.44	.05	.01	.01	.27	1.06	.86	3.51	14.77
Tehachapi	3964	24	1.39	2.49	1.63	1.30	.40	.10	.01	.11	.09	.45	.56	1.96	10.47
Ventura	50	9	3.18	1.64	2.38	.40	.38	.08	.04	T	.28	.67	1.18	1.88	12.11
Volcano Springs .	−220	12	.26	.32	.11	T	T	.00	.11	.09	.01	.17	.08	.43	1.59
Whittier	239	12	2.55	1.79	2.48	.24	.66	.06	.00	.08	.02	.89	1.33	1.56	11.65

Austral	Transition	Atlantic Humid
		Western Arid
		Pacific Humid
	Upper Austral	Upper Carolinian
		Upper Sonoran
	Lower Austral	Lower Carolinian
		Louisianian
		Lower Sonoran

BOREAL REGION

General Description

In southern California the Boreal Region occupies the uppermost altitudes of the prominent mountain peaks, seldom descending lower than 2550 meters. It is therefore comparatively restricted, appearing only on the following peaks: Pinos, North Baldy, Pine, San Antonio, Sugarloaf, San Bernardino, San Gorgonio, San Jacinto, and Santa Rosa. The region is most extensive in the vicinity of Mount San Gorgonio and Mount San Bernardino, where it covers the high ridges connecting the peaks and the spurs leading from them.

The three zones of the Boreal Region are less clearly defined than in more northerly territories, chiefly because the area covered by it is so limited. The presence of the Arctic-alpine Zone was first noted by Hall[3], who discovered three characteristic Alpine species, *Carex Preslii*, *Oxyria digyna*, and *Ranunculus Eschscholtzii* on steep north slopes of Mount San Jacinto near perpetual snow. To this scanty list Parish[4] has added *Arenaria hirta verna* and *Antennaria alpina* from Mount San Gorgonio. The presence even of this small number of truly Arctic-alpine species is of considerable interest, for, as pointed out by Hall and Parish, they mark "the most southern known limit of the Artic flora on the North American Continent."

Canadian Zone

The two lower zones, the Hudsonian and the Canadian, are inseparable in southern California. Parish suggests that *Pinus Murrayana* characterizes the Canadian, and *Pinus flexilis* the

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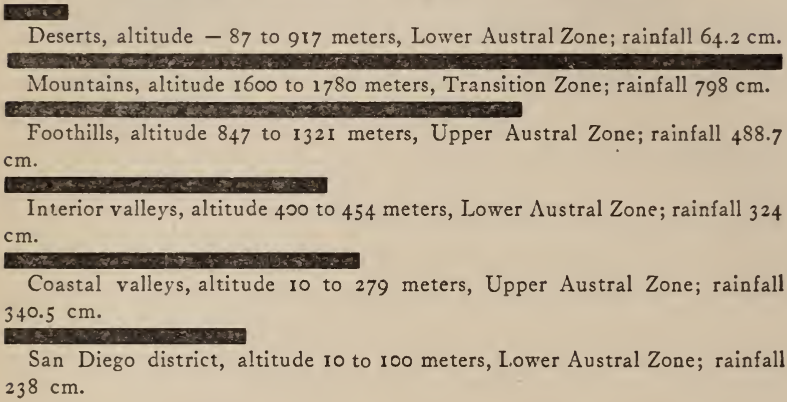
[3] Hall, H. M. A botanical Survey of San Jacinto Mountain. Univ. Calif. Publ., Bot. **1**: 16. 1902.

[4] Parish, S. B. Sketch of the Flora of southern California. Bot. Gaz. **36**: 203–222 and 259–279. 1903.

Chart of the Annual Rainfall Records, Classified According to the Phytogeographic Sections

(Each column represents one eighth the actual rainfall)



Deserts, altitude — 87 to 917 meters, Lower Austral Zone; rainfall 64.2 cm.

Mountains, altitude 1600 to 1780 meters, Transition Zone; rainfall 798 cm.

Foothills, altitude 847 to 1321 meters, Upper Austral Zone; rainfall 488.7 cm.

Interior valleys, altitude 400 to 454 meters, Lower Austral Zone; rainfall 324 cm.

Coastal valleys, altitude 10 to 279 meters, Upper Austral Zone; rainfall 340.5 cm.

San Diego district, altitude 10 to 100 meters, Lower Austral Zone; rainfall 238 cm.

PHYTOGEOGRAPHIC FEATURES

GENERAL DESCRIPTION

Phytogeographically southern California is separated into three clearly defined floral divisions—the coastal slope, the mountain, and the desert. Each of these divisions has derived its characteristic plants from different floral elements. The species of the coastal slope are principally of Californian origin; the species confined to the mountains, boreal or of boreal ancestry; and those of the deserts, endemic or migrants from the Great Basin, Sonora, or Lower California. To discuss these different floras intelligently it is essential that some general system be followed. Engler's[1] arrangement has many commendable features, but Merriam's[2] system of North American life zones has been more completely worked out for this country and is therefore adopted.

An outline of Merriam's life zones for North America north of the tropics is as follows:

Region	Zone	Area
Boreal	Arctic-alpine	
	Hudsonian	
	Canadian	

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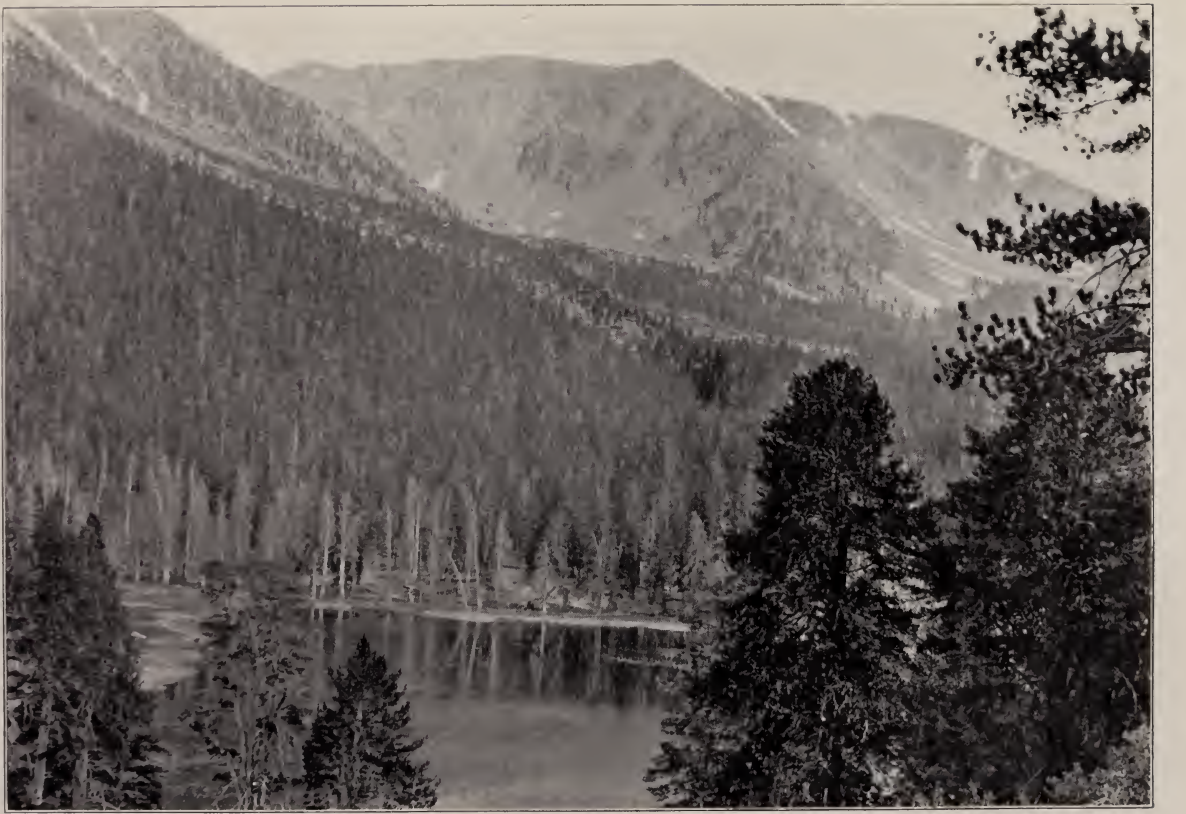
[1] Engler, A. Syllabus der Pflanzenfamilien, 213–222. 1907.

[2] Merriam, C. H. Life Zones and Crop Zones of the United States. Bull. U. S. Biol. Survey, No. 10. 1898.



PINUS MURRAYANA AND P. FLEXILIS. DRY LAKE, SAN BERNARDINO MOUNTAINS.

Hudsonian, but such a distinction is not tenable, for on Mount San Gorgonio, where the Boreal Region is best developed, both species intermingle from the neighborhood of Dry Lake (altitude 2775 meters) to the very summit. Ascending the mountain from Dry Lake one passes through pure forests of these two pines. Even the floor, which is composed of loose broken granitic rock, is almost bare of vegetation. Continuing upward the trees become fewer and more reduced in stature until it is difficult to walk beneath their gnarled branches. Finally, as the summit is approached, they become prostrate shrubs with such stiff compact branches that one may tramp over them with little difficulty. On the summit of Mount Pinos, where *Pinus Murrayana* has not been recorded, *Pinus flexilis* is found intermingling with *Abies concolor* and other upper Transition species. In fact it is impossible to detect two distinct belts of these two pines on any of the mountains. Notwithstanding the fact, therefore, that there are traces of Arctic-alpine plants, the only logical treatment demands that all the Boreal Region of southern California be placed in the Canadian Zone.

In addition to the localities mentioned there is a fringe of the Canadian Zone on the western borders of Bear Valley, and Bluff Lake. *Pinus Murrayana* grows rather abundantly here, the lowest altitude (2010 meters) reached by this species in southern California.

The characteristic trees and shrubs are:

Pinus flexilis
Pinus Murrayana
Populus tremuloides
Salix glaucops
Ribes montigenum
Sericotheca concolor
Phyllodoce Breweri

Sericotheca concolor and *Phyllodoce Breweri* extend northward through the Sierra Nevada to the southern Cascade Mountains, and to the mountains of western Nevada. All the remaining species extend to the Rocky Mountains, and one, *Populus tremuloides*, to the northern Atlantic. The geographical distribution of these species demonstrates the intimate relation the flora of this zone bears to that of the more northern parts of North America.

The origin of a boreal flora on these isolated southern mountain peaks is traceable to the influence of the Glacial Period. During that period central and southern California possessed a climate similar to that found to-day in the Puget Sound region. Perpetual snow and glaciation extended down the mountain slopes to approximately 1800 meters altitude. The Canadian Zone, therefore, probably was as low as 900 meters or even lower, forming an unbroken belt, with the possible exception of San Gorgonio Pass, from the Sierra Nevada to San Pedro Martir Mountain. The receding of the ice and the consequent northern and upward migration of the plants left these isolated remnants stranded on the higher peaks.

From the standpoint of regional distribution it is significant that only one species, *Populus tremuloides*, extends east of the Rocky Mountains. It argues that an eastern and western area should be recognized.

AUSTRAL REGION

General Description

The Austral Region occupies nearly the entire area of southern California, in the midst of which, on the tips of the highest mountain peaks, are situated the small isolated areas of typical Boreal. The three zones of the region are distinctly defined over large areas, but on account of great local variations in climatological conditions, due to slope exposure, sea-breezes, desert winds or other influences, isolated patches of a zone may be found far beyond its normal range.

Transition Zone

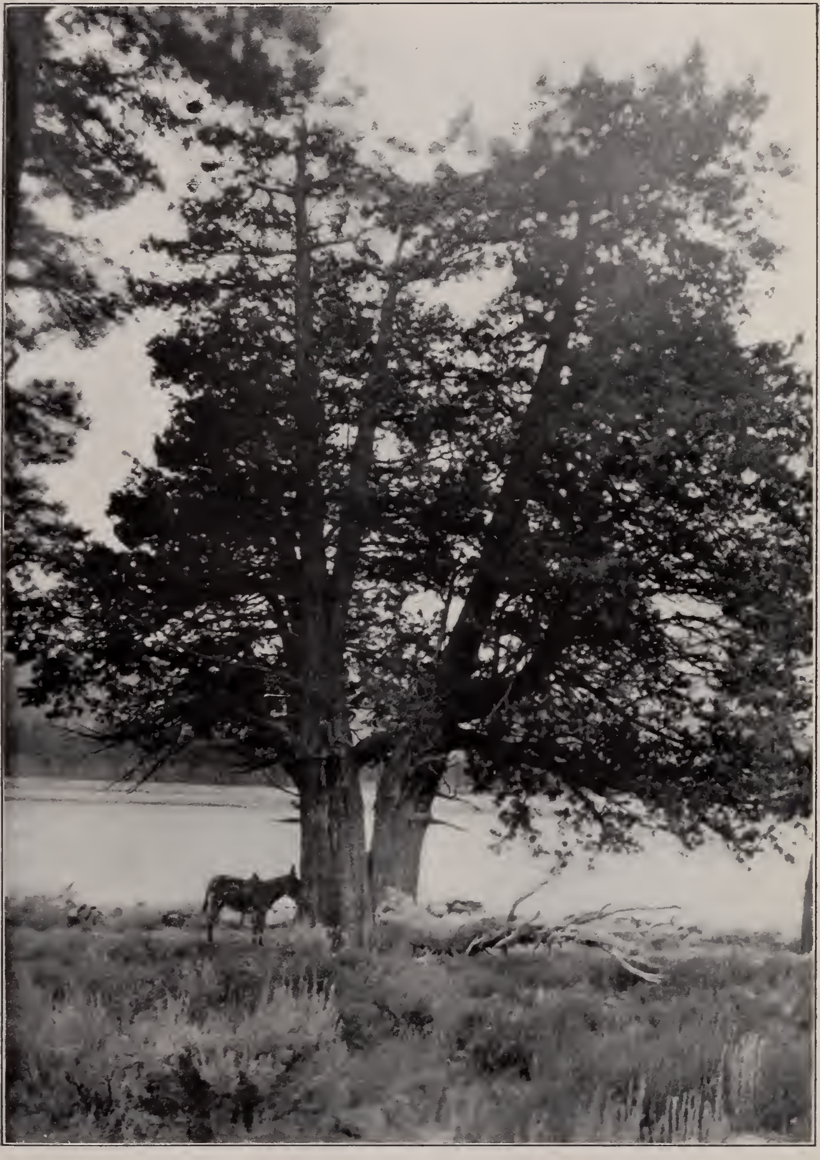
The Transition Zone, which is best characterized by the yellow pine (*Pinus ponderosa*), includes the principal forested area of the mountains. Its average range of altitude is from 1500 to 2700 meters, but deviations from this, chiefly due to slope exposure, are often considerable.

The forests are principally coniferous with a few scattered oaks, and along streams, poplars, willows, alders and maples. They are usually open and park-like, with a sparsely grass-covered floor, or with growths of low underbrush, which in rocky exposed places often develop into chaparral.

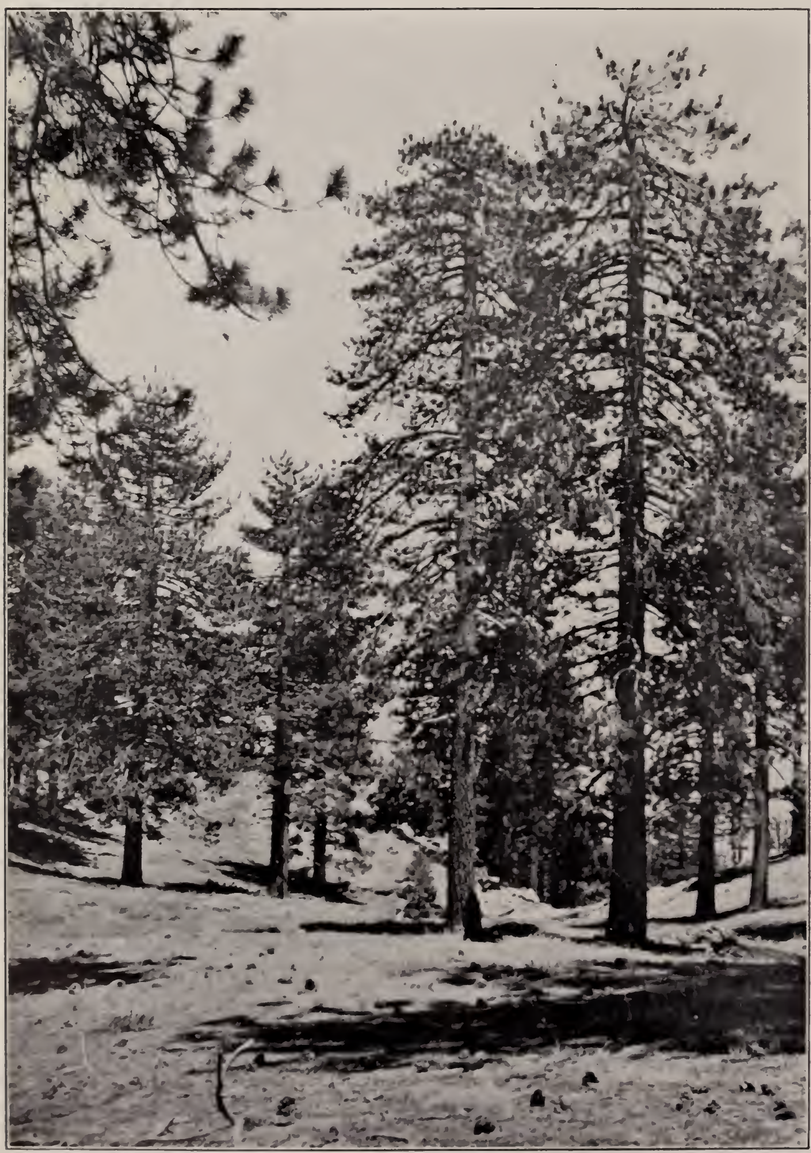
Approximately 50 species of trees and shrubs have been recorded within the Transition Zone, of which the following are characteristic:

Pinus Lambertiana
Pinus ponderosa

Ceanothus integerrimus puberulus
Ceanothus Palmeri



JUNIPERUS OCCIDENTALIS. BEAR VALLEY, SAN BERNARDINO MOUNTAINS.



PINUS PONDEROSA JEFFREYI. MOUNT PINOS.

Pinus ponderosa Jeffreyi
Pinus Coulteri
Abies concolor
Heyderia decurrens
*_Juniperus occidentalis_
*_Salix Scouleriana_
Quercus Kelloggii
*_Castanopsis sempervirens_
Ribes nevadensis
Rubus leucodermis
Rubacer velutinus
Cercocarpus ledifolius
Cercis occidentalis
*_Ceanothus cordulatus_
Cornus Nuttallii
Azalea occidentale
Uva-ursi Parryana
*_Uva-ursi patula_
Uva-ursi Pringlei
*_Leptodactylon Hookeri_
Eriodictyon Parryi
Ramona pachystachya
Pentstemon jacintensis
Sambucus mexicana
*_Symphoricarpus Parishii_
Chrysothamnus stenophyllus
Artemesia tridentata
Tetradymia canescens

The species designated by an asterisk (*) are confined to the upper parts of the Transition and extend into the Canadian Zone.

A study of the geographical distribution of the species found in the Transition Zone shows that about sixty per cent. are limited to California (including San Pedro Martir Mountain) or extend only into the southern part of the Cascade Mountains; fifteen per cent. extend northward along the Coast or the Cascade Mountains of Oregon and Washington; ten per cent. are common to California and the Great Basin, and twelve per cent. occur throughout the Western Arid Area.

To express the phytogeographical conditions of this zone accurately it is evident that the divisions must reckon with the large percentage of purely Californian or endemic species. The simple statement that the flora belongs to the Transition Zone, as is usually the case, or that it is in the Western Arid Area, is misleading, as many of the species are not found in other parts of these divisions. It is essential that the areas recognized by Merriam, and based upon moisture, be divided into sub-areas, _which are chiefly the result of a third factor—geographical segregation._

Without undertaking a discussion of the entire Western Arid Area, the California mountains, on account of the large number of endemic genera and species, are recognized as a distinct division of the area. This may be termed the Sierran Sub-area.

The Sierran Sub-area is best characterized by _Pinus ponderosa Jeffreyi_, _Pinus Lambertiana_ and _Heyderia decurrens._ Its geographical limits on the north are most satisfactorily defined by the Klamath Gap. South of this gap the Sub-area occupies the Transition Zone of the Sierra Nevada and the inner Coast Ranges of central California, and extends through the mountains of southern California to Mount San Pedro Martir.

In the Sierra Nevada the Transition Zone is fairly continuous, extending almost unbroken from the north Coast Ranges around the head of the Sacramento Valley, and southward along the western slopes of the Sierra Nevada. The southern inner Coast Ranges and the mountains of southern California, on the other hand, are composed of isolated ranges. Hence great gaps occur in the Transition Zone of these ranges, which form barriers to the migration of species. Each of these sections is usually represented by several peculiar species, while others are conspicuous by their absence. The Sierran Sub-area separates, therefore, into three natural divisions, the Sierra Nevada District, the South Coast Range District, and the San Bernardino District. The latter includes the Transition Zone of the San Gabriel and San Bernardino ranges, and the mountains southward to San Pedro Martir. In this district there are several endemic species, such as *Acer bernardinum*, *Ceanothus integerrimus puberulus*, and *Ceanothus Palmeri*, while many of the species common in the northern districts are absent.

UPPER AUSTRAL ZONE

General description.—The Upper Austral Zone in southern California is represented wholly by the Upper Sonoran Area, which includes two distinct sections, the coastal slope and the piñon and juniper belts of the desert slopes of the mountains. The characteristic plants of these two sections represent two different floral elements. The coastal slope species are predominantly Californian, while many of those on the desert slopes belong to the Great Basin element.

Coastal slope.—The coastal slope of southern California is separated from the more northern parts of the Californian Sub-area[5] along the seaboard by Point Conception. The coast to

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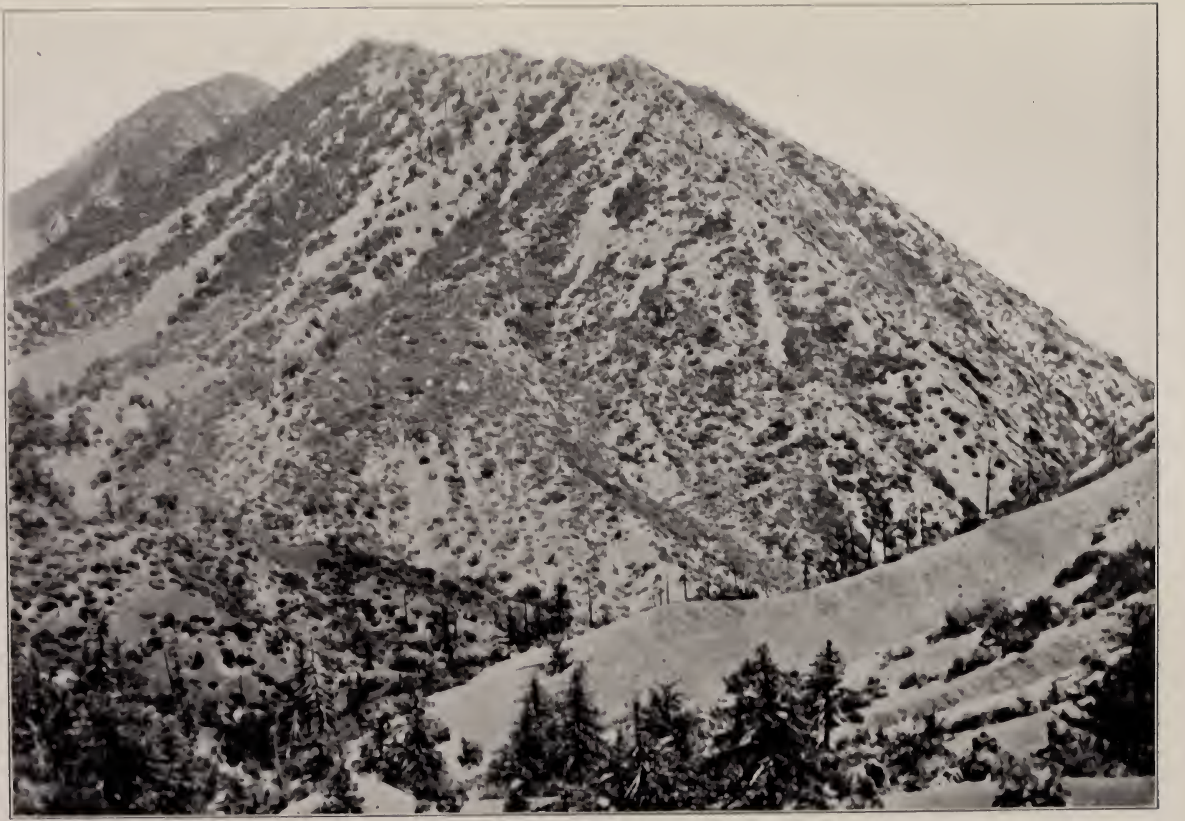
[5] The California Sub-area, which is equivalent to Engler's "Innerkalifornische" zone of the "Westamerikanische Wüsten- und Steppenprovinz," is that part of the Upper Sonoran Area which lies west of the Sierra Nevada divide, and extends from southern Oregon to northern Lower California. The name "intramontane" has been applied to this region, but it is best to restrict that term to the floral district of the sub-area which lies between the Sierra Nevada and the Coast Ranges of central and northern California. "Cismontane" as used by Parish (*l. c.*) includes parts of two zones, which seems illogical.



PSEUDOTSUJA MACROCARPA AND CHAPARRAL. TOPATOPA MOUNTAINS.

the southward of this promontory turns directly eastward for 125 kilometers or more, paralleling the cross ranges which lie only a few miles distant. The coastal country is therefore protected from the northwest coast winds, and its warm southern slopes form a striking contrast to the cold bleak wind-swept mesas and hills about the promontory. A natural barrier is thus formed where a large number of species meet their southern or northern limits.

South of Point Conception the entire coastal slope below the Transition Zone belongs to the Upper Sonoran, except the interior valleys and the southwestern part of San Diego County which are Lower Sonoran.

Within this area, which we shall term the Southern California District, are over 100 species of trees and shrubs. A study of the geographical distribution of these species shows that only four extend eastward as far as the Rocky Mountains, less than ten per cent. north to the Columbia River, and about the same number east to the Great Basin and Arizona. Nearly all the remaining species, or fully two thirds of the entire number are confined to the California Sub-area, and of these about forty are chiefly confined to the Southern California District.

The most characteristic species of the Southern California District is _Pseudotsuga macrocarpa_. The geographical limits of this conifer almost coincide with those of the district. It does not extend northward beyond the Santa Ynez Mountains, nor beyond Fort Tejon in the mountains connecting with the Sierra Nevada. It is confined, however, to the upper altitudes, extending even into the Transition Zone.

The following trees and shrubs are characteristic of the Southern California District, being almost or wholly confined within its boundaries:

Pseudotsuga macrocarpa
Juglans californica
Eriogonum cinereum
Eriogonum fasciculatum foliolosum
Atriplex Breweri
*_Clematis pauciflora_
Odostemon Nevinii
Ribes indecorum
Grossularia amara
*_Ceanothus Orcuttii_
Ceanothus megacarpus
Ceanothus crassifolius
Vitis Girdiana
Malacothamnus fasciculatus
Malacothamnus Nuttallii
Styrax californica flavescens
Leptodactylon californicum glandulosum
*_Eriodictyon crassifolium_

Grossularia hesperia
Grossularia Parishii
*_Adenostoma sparsifolium_
Rosa Aldersonii
*_Xylothermia montana tomentosa_
Lupinus longifolius
Lupinus Hallii
Rhamnus pilosa
Ceanothus spinosus
Ceanothus divaricatus eglandulosus
Ceanothus oliganthus
Trichostema Parishii
Sphacele fragrans
*_Diplacus longiflorus_
Diplacus puniceus
Pentstemon cordifolius
*_Penstemon ternatus_
Pentstemon antirrhinoides
Lonicera subspicata denudata
Ericameria cuneata spathulata
Ericameria Parishii
Baccharis Plummerae

The species designated by an asterisk (*) are restricted to the southern part of the district.

The general character of the vegetation is typical of a warm temperate climate which possesses moist cool winters and hot dry summers. The predominant plants are evergreen xerophyllous shrubs with small thick leathery leaves of a dull or grayish-green color. They are invariably stiff compact growers, forming impenetrable thickets that spread over the mountainsides in almost unbroken masses for many miles.

The diversity of the flora, however, is considerable. The proximity of the sea and the irregularities of the topography, together with the resultant climatic conditions, are factors that have aided in the development of several sub-districts with distinctive floral features. Three of these floral sub-districts are recognized: the Littoral, the Coastal, and the Interior. The first of these sub-districts is the territory the within immediate influence of the sea, the second comprises the fog belt, and the third the chaparral belt of the interior mountains and foothills which are more or less cut off from the direct influence of the sea-breeze by hills or low mountains. Where passes or other connections exist between the Interior and the Coastal Sub-district the floral changes are gradual and difficult to separate.

The Littoral Sub-district is confined to the immediate proximity of the sea, and is composed of four formations: the beach, the sand-dune, the salt-marsh, and the bluff. The number of shrubby plants wholly limited to this sub-district is small, _Eriogonum parvifolium_, _Lupinus Chamissonis_, and _Ericameria ericoides_ on the sand-dunes, and _Atriplex Breweri_ on the bluffs and edges of salt-marshes being the complete list.[6] Of these strictly maritime species, *Eriogonum parvifolium* extends northward to Monterey, and *Atriplex Breweri* to Santa Barbara. The other species are also confined to the California coast, but extend farther northward into northern California.

The Coastal Sub-district comprises the valleys and rolling hills along the coast, and the coast slope of the foothills and mountains which separate them from the interior valleys. Its inland boundary extends along the southern slope of the Santa Ynez Mountains, the coast slope of the mountains of Ventura County, and southward through the San Fernando and Santa Monica Mountains to the Santa Ana Mountains, thence along the western slope of the Palomar Mountains where it blends with the Interior Sub-district.

The principal plant formations of this area are the mesa and rolling hills, the alluvial, the oak-grove, the canyon, and the chaparral. The mesas and rolling grassy hills are characterized chiefly by the absence of woody plants rather than by any peculiar species. Along the inner boundary of this formation and merging with the Interior Sub-district are park-like groves of oaks. North of the Santa Monica Mountains, along their northern base, and in the Simi, Newhall and Ojai Valleys handsome trees of *Quercus lobata* abound. This species does not extend south of the Santa Monica Mountains, but its place south of this range is taken by *Quercus Engelmannii* which, together with *Quercus agrifolia*, covers considerable area about Pasadena, Santa Anita, and Fallbrook.

The following trees and shrubs are mostly confined to the Coastal Sub-district:

Myrica californica
Juglans californica
Quercus lobata
Quercus Engelmannii
Grossularia speciosa
Grossularia amara
Sericotheca franciscana
Lupinus longifolius
Malacothamnus Nuttallii
Ceanothus spinosus
Ceanothus sorediatus
Ceanothus oliganthus
Ceanothus megacarpus
Arbutus Menziesii
Trichostema lanatum
Ramona niveum

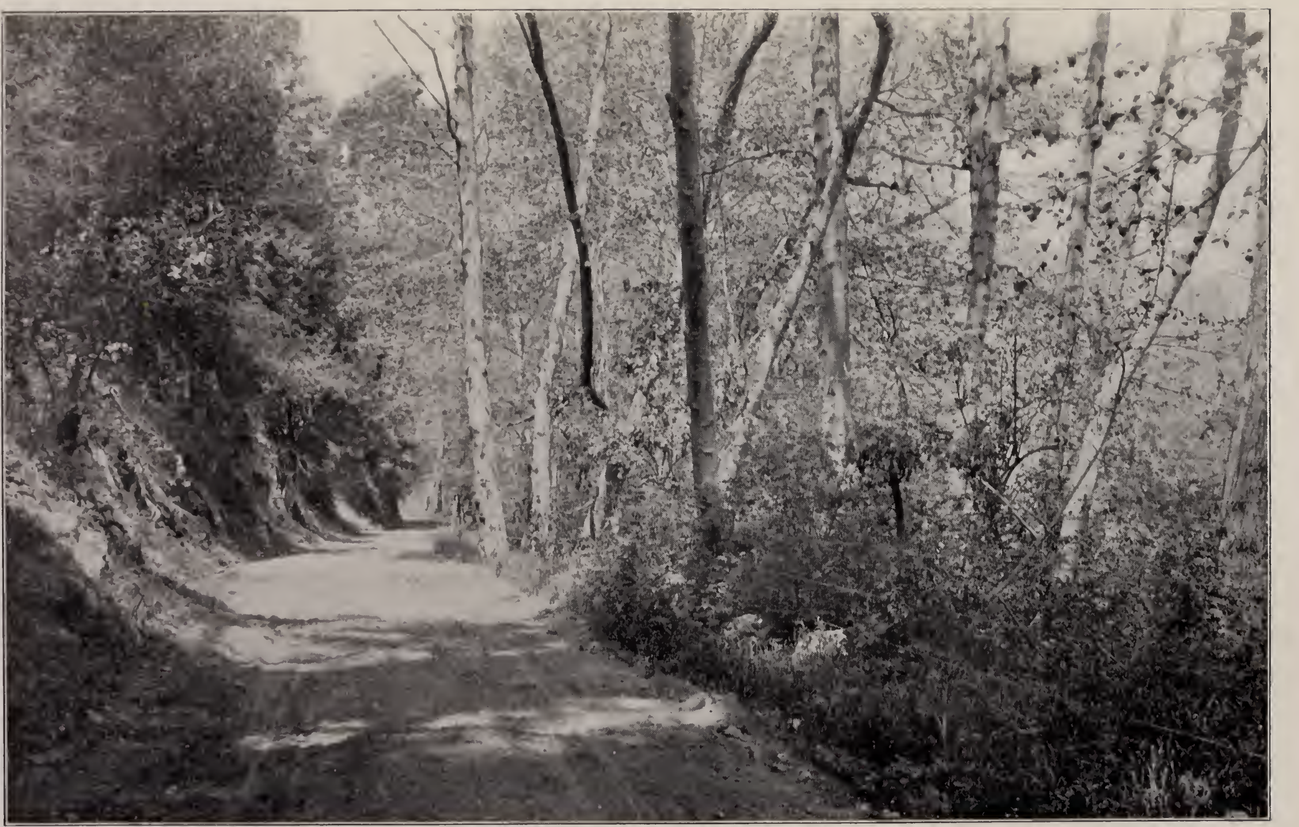
[6] In addition to these true shrubs there are a number of suffrutescent perennials that are also confined to this sub-district. Among these may be mentioned *Cheiranthus suffrutescens*, *Sphaerostigma viridescens*, *Batis maritima*, and *Salicornia ambigua*.

Polygala californica
Acer californicum
Lithraea laurina
Lonicera Ledebourii
Baccharis pilularis
Baccharis Plummerae

A large percentage of these species, which are chiefly confined to the northern part of the sub-district, are common in northern California. They simply reach their southern limit within this sub-district. In this connection the influence of the Santa Monica Mountains should not be passed by unnoticed. This cross range, although seldom reaching a higher altitude than 750 meters, exerts a marked influence on the northern and southern distribution of plants along the coast. The two oaks, *Quercus lobata* and *Quercus Engelmannii*, are notable examples of species that are checked by this range in their northerly or southerly distribution. Several northern shrubs, such as *Myrica californica* and *Baccharis pilularis*, do not occur south of this range.

The Interior Sub-district occupies the foothills and the typical chaparral of the interior mountains which are shut off from the direct influence of the sea-breeze by hills or low mountains. The western boundary is outlined by the Coastal Sub-district, and its inland by the Transition Zone of the higher mountains, or by the deserts in the lower mountains and passes. This sub-district extends from the Liebre Mountains southeastward along the coastal slope of the San Gabriel, the San Bernardino, the San Jacinto, and the Cuiamaca mountains.

The chaparral, of which the sub-district is almost wholly composed, is separated into several altitudinal belts. These altitudinal floral changes are very evident to one ascending any of the mountain trails. Along the base of the mountains, sometimes extending up their slopes several hundred feet and out over the footslopes, is a belt intermediate between the Upper and Lower Sonoran. Here the prevailing plants are *Ramona stachioides*, *Eriogonum fasciculatum foliolosum* and *Senecio Douglasii*. Ascending the steep mountain slopes one passes into the typical chaparral. *Adenostoma fasciculatum* prevails through the lower altitudes in the eastern part of the San Gabriel Mountains, and in the San Bernardino and the San Jacinto Mountains, but on the Mount Wilson trail, which is intermediate between the Coastal and the Interior Sub-districts, *Quercus dumosa* and *Ceanothus crassifolius* are the predominating species. Further up the slopes these species gradually give way to others, of which *Ceanothus divaricatus*



ALNUS RHOMBIFOLIA. WATERMAN CANYON, SAN BERNARDINO MOUNTAINS.

eglandulosus, *Uva-ursi tomentosa*, and, in the San Bernardino Mountains, *Uva-ursi pungens*, are perhaps the most characteristic. *Pseudotsuga macrocarpa* grows with these species, especially on the north slopes. This tree becomes more abundant at higher altitudes and extends into the lower part of the Transition Zone.

In the canyons, *Quercus chrysolepis*, *Acer macrophyllum* and *Umbellularia californica* seldom descend lower than 750 meters; but *Alnus rhombifolia* often follows living streams into the edges of the valleys. *Platanus racemosa* is mostly confined to the lower altitudes, and occurs on the canyon floors, often following the washes well out into the valleys.

The following trees and shrubs are mainly restricted to the Interior Sub-district:

Pseudotsuga macrocarpa
Ribes indecorum
Adenostoma sparsifolium
Xylothermia montana tomentosa
Lupinus Hallii
Ceanothus divaricatus eglandulosus
Ceanothus crassifolius
Uva-ursi pungens
Trichostema Parishii
Pentstemon ternatus
Pentstemon antirrhinoides
Ericameria Parishii

Desert slopes.—The Upper Sonoran Area on the desert slopes of the mountains is commonly called the piñon and juniper belts, the two conifers, *Pinus monophylla* and *Juniperus californica* being the most characteristic species. The piñon occurs in the upper altitudes of the zone (1200-1800 meters). The juniper, on the other hand, occupies the lower altitudes (900–1200 meters), and along the lower edges of the belt mingles with the yuccas and other shrubs characteristic of the Lower Sonoran.[7] In the Providence Mountains *Juniperus utahensis* replaces *Juniperus californica.* This is the only locality where this species enters into our territory, but in the Panamint Mountains it also replaces *Juniperus californica*, and extends from there eastward over southern Nevada and Utah. Each of these species may be considered as representing a distinct floral district.

Several trees and shrubs which belong properly to the Intramontane district penetrate through Tejon Pass and extend in a narrow belt along the western slope of Antelope Valley. The normal flora of the desert slopes is modified in this section by the presence of such species as _Pinus Sabiniana_, _Quercus Douglasii_, _Grossularia quercetorum_ and _Aesculus californica._

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[7] The juniper belt is retained in the Upper Sonoran with reluctance, for over a large part of the belt the associating species are predominantly Lower Sonoran. On the coastal slope if we found the juniper at all we should expect it in the Upper Sonoran, if it actually belongs in that zone, but instead it occurs only in the Lower Sonoran of the interior valleys.

Along the Mexican Boundary a number of Peninsular species enter the flora in the piñon belt. Of these _Pinus quadrifolia_ is the most noteworthy. This nut pine, which almost entirely replaces _Pinus monophylla_ a few miles below the international boundary, occurs sparingly as far north as the Santa Rosa Mountains.

The following are the characteristic Upper Sonoran trees and shrubs of the desert slopes:

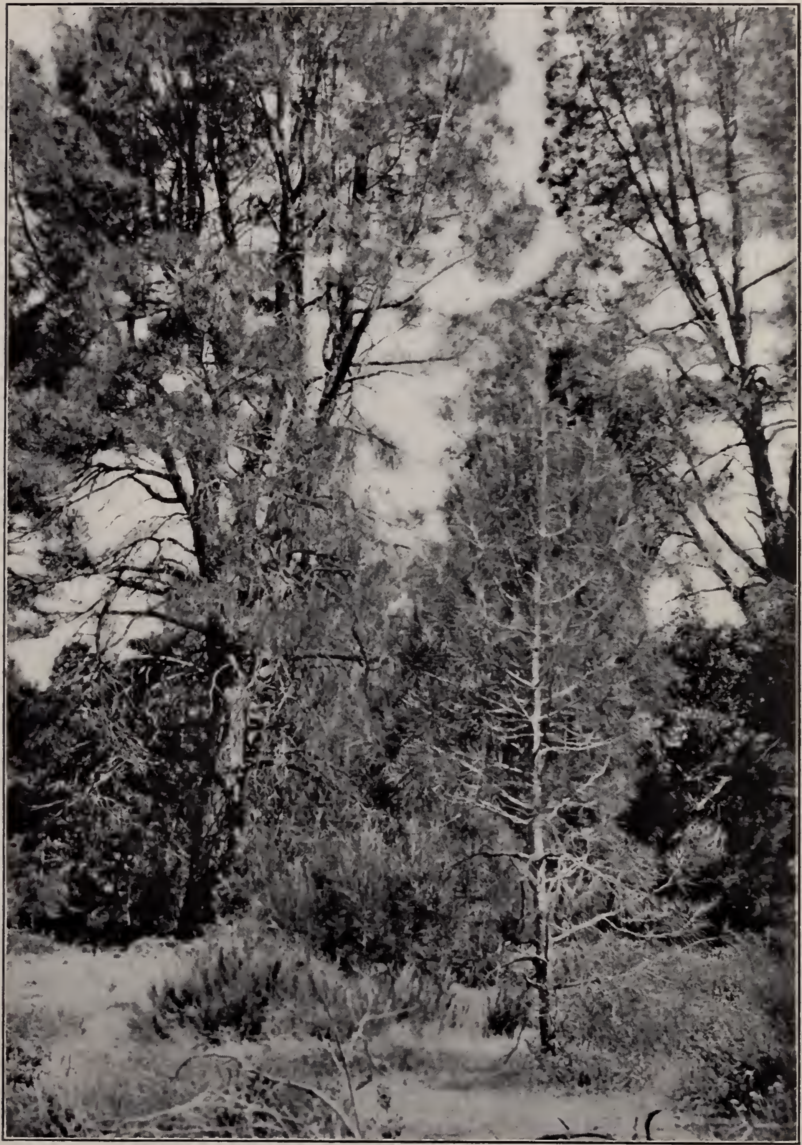
*_Pinus monophylla_
*_Pinus quadrifolia_
Juniperus californica
Juniperus utahensis
Ephedra viridis
*_Quercus Alvordiana_
*_Quercus Dunnii_
*_Quercus turbinella_
Eriogonum fasciculatum polifolium
*_Eriogonum Heermanii_
*_Odostemon Fremontii_
Isomeris arborea globosa
*_Kunzia glandulosa_
*_Rhamnus cuspidata_
*_Ceanothus vestitus_
Malacothamnus Fremontii
*_Fremontodendron californicum_
Fraxinus velutinus
Fraxinus anomala
Diplacus aridis
Stenotopsis interior

The species designated by an asterisk (*) are confined to the upper or piñon belt.

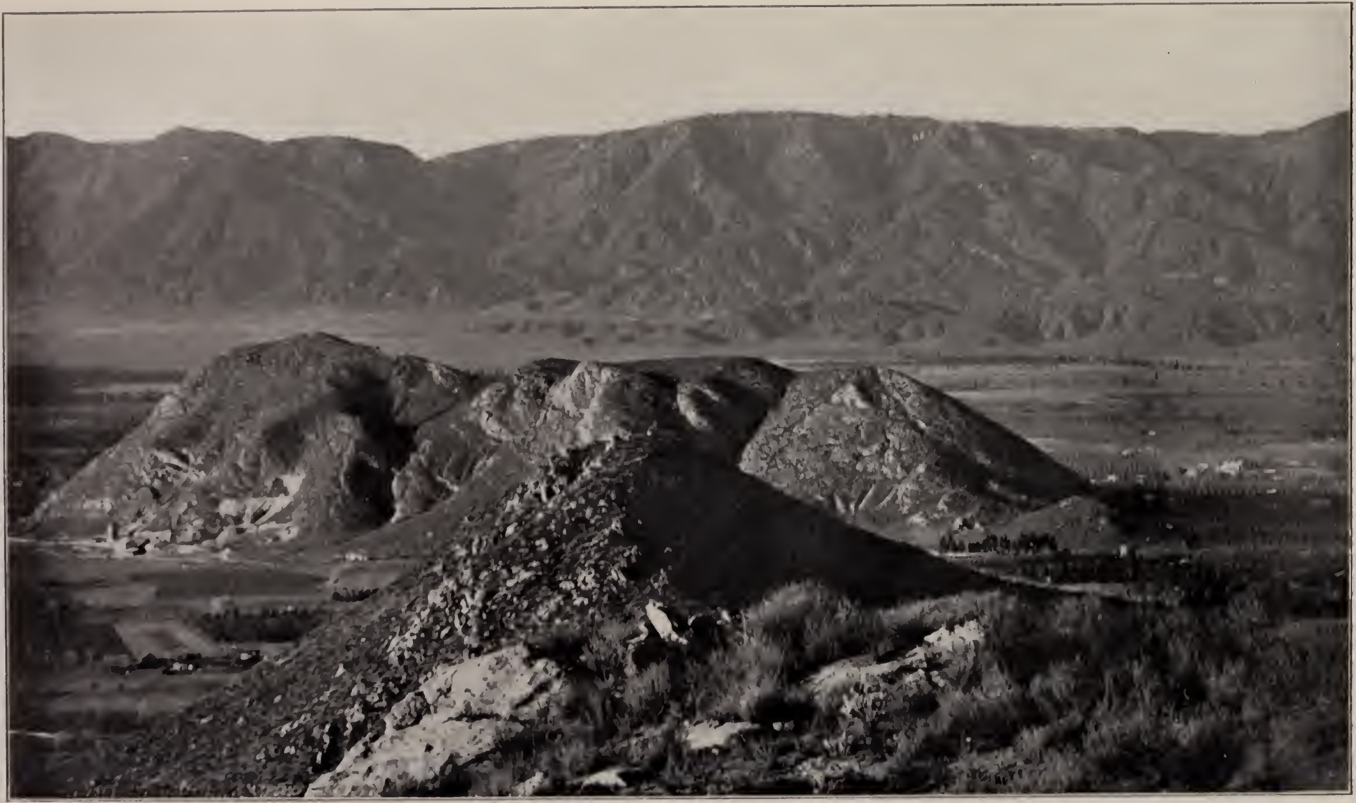
LOWER AUSTRAL ZONE

General description.—The Lower Austral Zone in southern California is represented by the Lower Sonoran Area. It includes all of the desert regions below the juniper belt, and protrudes through the lower passes into the hot interior valleys of the coastal slope. It also extends northward along the coast of Lower California to the vicinity of San Diego.

Three floral elements enter into the composition of the Lower Sonoran in southern California, the Great Basin, the Sonoran, and the Peninsular. In the Mohave Desert many of the characteristic species are of the Great Basin element, in the Colorado Desert the Sonoran and the Peninsular species predominate, and at San Diego the Peninsular. Unfortunately the Lower Sonoran Area has not been sufficiently explored to warrant its division into sub-areas. Each of the southern California sections



PINUS SABINIANA. OAKGROVE CANYON, LIEBRE MOUNTAINS.



LOOKING NORTHEAST ACROSS SAN BERNARDINO VALLEY.

of the zone will be discussed, therefore, without an attempt to assign them to definite floral districts.

Interior valleys.—In the San Fernando, the San Bernardino, and the San Jacinto Valleys, the fan-like footslopes that spread over the valleys from the bases of the steep mountain slopes, and the dry washes leading from the mouths of the canyons give rise on their semi-arid gravelly slopes to a low shrubby type of vegetation resembling that of the desert in its xerophytic habit. The upper parts of the footslopes, as has been previously stated, are intermediate between the Upper and the Lower Sonoran, but the dry washes produce a typical Lower Sonoran flora, that often spreads over the greater part of the footslopes.

Following is a list of characteristic Lower Sonoran trees and shrubs of the interior valleys:

Salix vallicola
Populus Fremontii
**Strombicarpus pubescens*
**Prosopis glandulosa*
Opuntia bernardina
Opuntia Covillei
**Chilopsis linearis*
Gutierrezia divergens
Ericameria pinifolia
**Encelia farinosa*
Viguiera Parishii
Bebbia juncea
Lepidospartum squamatum
Tetradymia comosa

The species designated by an asterisk (*) occur only in the eastern end of the San Bernardino Valley or in the San Jacinto Valley, and of these only *Encelia farinosa* is common.

San Diego district.—A large number of peninsular species of shrubs and herbaceous plants extend into southwestern San Diego County which give a floral aspect quite unlike that of other parts of the coastal slope.

The following is a list of peninsular or desert species recorded from the vicinity of San Diego:

Ephedra californica
Yucca mohavensis
Atriplex canescens
Isomeris arborea
Prosopis velutina
Cneoridium dumosum
Acalypha californica
Tricherostigma miserum
Simmondsia californica
Adolphia californica
Opuntia prolifera
Opuntia californica
Lycium Richii
Lycium Andersonii Wrightii
Lycium californicum
Hymenoclea monogyra
Gaertneria chenopodifolia
Iva Hindsiana
Viguiera laciniata

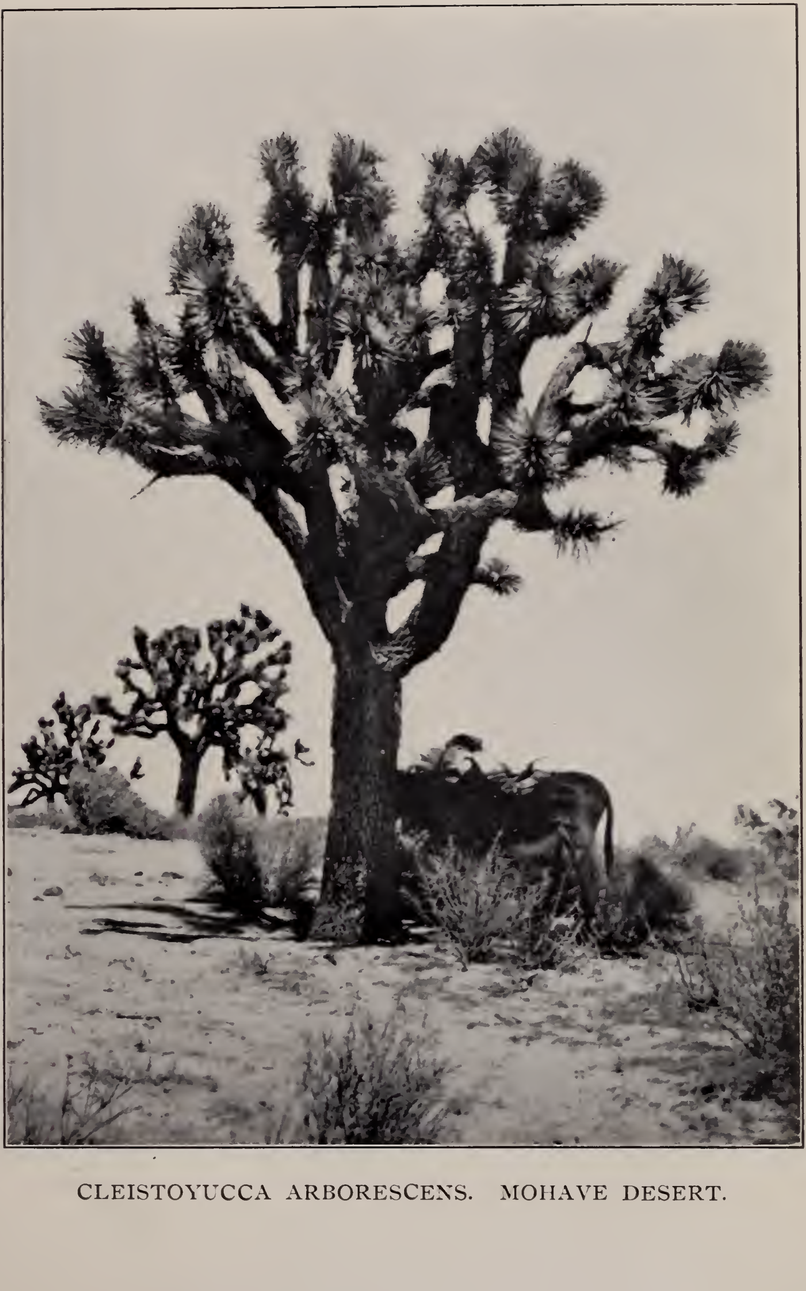
In addition to the typical Lower Sonoran species there are a number of other shrubby species peculiar to the San Diego region which are often the principal components of the chaparral. These species are: _Cercocarpus minutiflora_, _Adenostoma fasciculatum obtusifolium_, _Ceanothus verrucosus_, _Xylococcus bicolor_, and _Comarostaphylis diversifolia_. _Pinus Torreyana_ is also restricted to this, with the exception of a small grove on Santa Rosa Island.

Mohave Desert.—The Lower Sonoran Area occupies nearly the entire area of the Mohave Desert, only in the upper altitudes of the mountains is it replaced by the juniper and piñon belts of the Upper Sonoran. Wherever the soil conditions are favorable _Covillea tridentata_ predominates. This shrub, commonly known as the "creosote bush," is the most characteristic species of the entire Lower Sonoran Area, at least in the arid parts; but, on account of its wide range and its association in the various regions with markedly different floral elements, it cannot be utilized in segregating phytogeographical districts.

Along the upper edges of the _Covillea_ belt, and often extending into the edges of the juniper belt, are a number of characteristic desert shrubs, such as _Grayia spinosa_, _Tetradymia spinosa_, _Tetradymia stenolepis_, _Amygdalus Fremontii_ and _Adelia neo-mexicana._ Associated with these is the tree yucca (_Cleistoyucca arborescens_), locally known as the "Joshua tree." The great stretches of this desert yucca that spread over the gradually sloping plains resemble immense orchard tracts, and form a prominent feature of the landscape.

The following Lower Sonoran trees and shrubs have been recorded in the Mohave Desert within the limits of our territory:

*_Ephedra nevadensis_
*_Ephedra californica_
*_Yucca mohavensis_
Cleistoyucca arborescens
*_Populus Fremontii_
*_Salix vallicola_
*_Salix argophylla_
Eriogonum Plumatella
*_Atriplex lentiformis_
*_Atriplex polycarpa_
*_Atriplex confertifolia_
Atriplex Parryi
*_Echinocactus Lecontei_
*_Echinocactus polycephalus_
Menodora spinescens
Adelia neo-mexicana
Ramona pilosa
Ramona capitata
*_Lycium Cooperi_
Lycium Andersonii
Salazaria mexicana
*_Chilopsis linearis_
*_Hymenoclea Salsola_
Gaertneria eriocentra



CLEISTOYUCCA ARBORESCENS. MOHAVE DESERT.

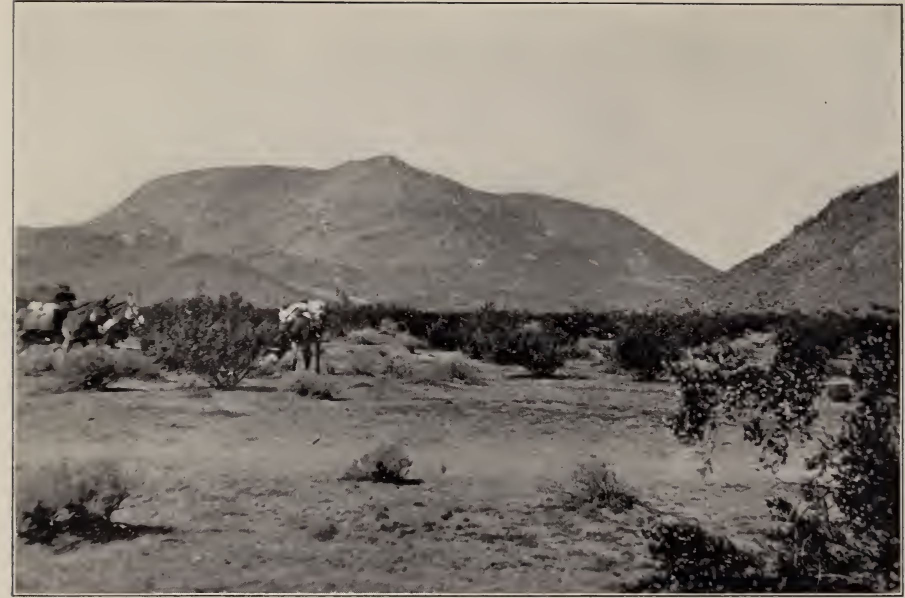


Fig. 1.

COVILLEA TRIDENTATA. NEAR WILLOW SPRINGS.

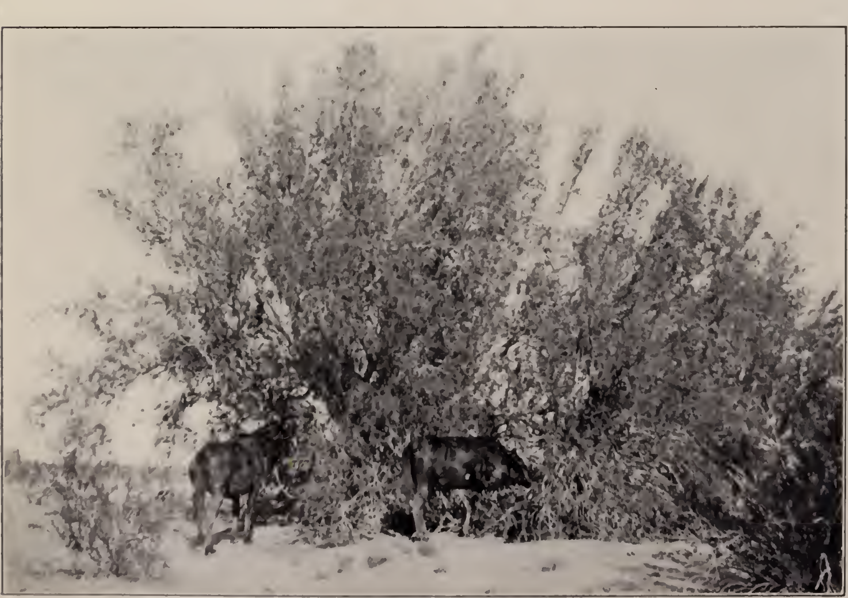


Fig. 2.

OLNEYA TESOTA. SIGNAL MOUNTAIN.

*_Atriplex hymenelytra_
*_Atriplex canescens_
Atriplex Torreyi
Grayia spinosa
*_Eurotia lanata_
*_Allenrolfia occidentalis_
Sarcobatus vermiculatus
Lepidium Fremontii
*_Isomeris arborea_
*_Isomeris arborea globosa_
*_Isomeris arborea angustata_
Fallugia paradoxa
Cowania Stansburiana
*_Coleogyne ramosissima_
Kunzia glandulosa
Amygdalus Fremontii
*_Strombocarpus pubescens_
*_Prosopis glandulosa_
*_Krameria parvifolia_
Parosela arborescens
*_Parosela californica_
Parosela Fremontii
Parosela Saundersi
*_Covillea tridentata_
*_Thamnosma montanum_
*_Opuntia ramosissima_
*_Opuntia Bigelovii_
*_Opuntia acanthocarpa_
*_Opuntia echinocarpa_
*_Opuntia Covillei_
*_Opuntia chlorotica_
*_Gaertneria dumosa_
*_Hofmeisteria pluriseta_
*_Coleosanthus atractyloides_
Coleosanthus incana
*_Coleosanthus linifolia_
*_Coleosanthus desetorum_
Coleosanthus Knappiana
Gutierrezia lucida
*_Acamptopappus sphaerocephalus_
*_Stenotopsis interior_
Ericameria monactis
Acamhiacyris Fremontii
*_Chrysothamnus teretifolius_
Chrysothamnus mohavensis
*_Chrysothamnus occidentalis_
*_Baccharis Emoryi_
*_Baccharis sergilioides_
*_Baccharis glutinosa_
*_Pluchea sericea_
*_Bebbia juncea aspera_
*_Viguiera Parishi_
*_Encelia actoni_
*_Encelia frutescens_
Artemesia Parishii
*_Lepidospartum squamatum_
*_Peucephyllum Schottii_
Tetradymia glabrata
Tetradymia stenolepis
Tetradymia spinosa

The species designated by an asterisk (*) also occur in the Colorado Desert.

Colorado Desert.—Covillea is also the predominant plant over the dry mesas of the Colorado Desert. Above this belt is an area corresponding to the yucca belt of the Mohave Desert, but comprising a very different group of plants,[8] of which _Agave deserti_ is the most characteristic.

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[8] Parish, Bot. Gaz. **36**: 222. 1903.

In addition to the species common to both deserts the following are found only in the Colorado Desert:

Neowashingtonia filamentosa
Nolina Parryi
Prosopis velutina
Acacia Greggii
Parkinsonia aculeata
Parkinsonia microphylla
Cercidium Torreyana
Krameria Grayi
Parosela Emoryi
Parosela Schottii
Parosela spinosa
Olneya Tesota
Condalia Parryi
Foquieria splendens
Ramona Vaseyi
Beloperone californica
Gaertneria ilicifolia
Coleosanthus frutescens
Gutierrezia bracteata
Ericameria brachylepis
Baccharis sarothroides
Encelia farinosa

A study of the geographical distribution of the species not common to both deserts shows that the Mohave Desert species are of the Great Basin element, most of them being common to southern Nevada, southern Utah and northern Arizona, and that the species restricted to the Colorado Desert are of southern origin, and extend into Lower California, southwestern Arizona and northwestern Sonora.

EXPLANATION OF PLATES

Plate A

Relief map of California, from the original model by N. F. Drake. Published through the courtesy of the Department of Geology of Leland Stanford Jr. University.

Plate B

Dry Lake, San Bernardino Mountains, altitude 3180 meters, showing a pure forest of *Pinus Murrayana* and *Pinus flexilis*. Canadian Zone.

Plate C

Juniperus occidentalis, Bear Valley, San Bernardino Mountains, altitude 2230 meters. Transition Zone.

Plate D

Open park-like forest of *Pinus ponderosa Jeffreyi*, Mount Pinos, altitude 2300 meters. Transition Zone.

Plate E

Pseudotsuga macrocarpa intermingling with the chaparral, Topatopa Mountains, altitude 1800 meters. Upper Austral Zone.

Plate F

Alnus rhombifolia, Waterman Canyon, San Bernardino Mountains, altitude about 1200 meters. Upper Austral Zone.

Plate G

Pinus Sabiniana, Oakgrove Canyon, Liebre Mountains, altitude 1400 meters. Upper Austral Zone.

Plate H

Looking northeast across San Bernardino Valley, with Slover Mountain in the foreground and the San Bernardino Mountains in the distance. The valley is Lower Austral; the chaparral-covered slopes of the distant mountains, Upper Austral; the forests on the summits, Transition.

Plate I

Cleistoyucca arborescens, Mohave Desert, between Mohave and Lancaster, altitude about 800 meters. Lower Austral Zone.

Plate J

Fig. 1. *Covillea tridentata*, near Willow Springs, Antelope Valley, altitude about 840 meters. Lower Austral Zone.

Fig. 2. *Olneya Tesota*, eastern base of Signal Mountain, Colorado Desert, altitude about sea level. Lower Austral Zone.

ANNOTATED CATALOGUE OF THE SOUTHERN CALIFORNIA TREES AND SHRUBS

PINACEAE. Pine Family.

Leaves usually fascicled, surrounded at base by a sheath; cones maturing the second year. 1. *Pinus.*

Leaves not fascicled, without basal sheath; cones maturing the first year.

  Cones pendulous; leaves short-petioled. 2. *Pseudotsuga.*

  Cones erect; leaves sessile. 3. *Abies.*

1. PINUS. Pine.

Sheaths deciduous; leaves with 1 fibro-vascular bundle.

  Leaves in 5's.

    Leaves slender, 8–10 cm. long; cones cylindrical, 20–40 cm. long; wing of seed 2 cm. long. 1. *P. Lambertiana.*

    Leaves rigid, 3–6 cm. long; cones oval, 8–16 cm. long; wing a narrow ring, 1 mm. broad. 2. *P. flexilis.*

  Leaves 1–4 in a cluster; cones globose; scales much thickened; seeds large.

    Leaves usually in 4's. 3. *P. quadrifolia.*

    Leaves solitary. 4. *P. monophylla.*

Sheaths persistent; leaves with 2 fibro-vascular bundles.

  Leaves in 5's, wing thickened. 5. *P. Torreyana.*

  Leaves in 2's or 3's; wing thin.

    Leaves in 3's.

      Cones deciduous; scales tipped with a prickle.

        Cones 7–12 cm. long. 6. *P. ponderosa.*

Cones 12–25 cm. long. 6a. *P. ponderosa Jeffreyi.*
Cones more persistent; scales tapering to stout incurved points.
Leaves grayish-green, drooping; cones chestnut brown, oval, 15–25 cm. long. 7. *P. Sabiniana.*
Leaves blue-green, erect; cones yellowish-brown, long-oval, 25–35 cm. long. 8. *P. Coulteri.*
Leaves in 2's.
Cones deciduous, opening at maturity. 9. *P. Murrayana.*
Cones persistent for years, not opening at maturity. 10. *P. attenuata.*

1. PINUS LAMBERTIANA Dougl. Trans. Linn. Soc. **15**: 500. 1827.

Pinus Lambertiana minor Lemmon, Second Bienn. Rep. Calif. State Forest. 70, 83. 1888.

Type locality: On the head waters of the Umpqua River.

Distribution: The Sugar pine is characteristic of the Sierran District. It occurs from central Oregon southward to San Pedro Martir Mountain, Lower California. Transition.

Specimens examined: Mount Pinos, *Elmer 4196;* Swartout Valley, San Gabriel Mountains, *Abrams & McGregor 650;* Mount San Antonio, *Abrams 2701;* Strawberry Valley, San Jacinto Mountains, *Leiberg 3141;* Mount San Gorgonio, *Dutton*, 1897; mountains east of San Diego, *Parry*, 1850.

2. PINUS FLEXILIS James, Long's Exped. **2**: 27. 1823.

Type locality: "Inhabits the arid plains subjacent to the Rocky Mountains, and extends up their sides to the region of perpetual frost."

Distribution: The limber pine occurs on the eastern slopes of the continental divide from Alberta to western Texas, and ranges westward over the mountains of Wyoming, Utah, Nevada, northern New Mexico, northern Arizona and southeastern California. In California it is found along the eastern slope of the Sierra Nevada south of Mono Pass, on the Inyo and Panamint Mountains, and on some of the higher peaks of southern California as noted below. It is characteristic of the Canadian Zone.

Specimens examined: Summit of Mount Pinos, *Abrams & McGregor 243;* North Baldy, San Gabriel Mountains, *Abrams & McGregor 605;* Dry Lake, Mount San Gorgonio, altitude 2800 meters, *Abrams & McGregor 785;* near the summit of Mount San Gorgonio, *Abrams & McGregor 748; Leiberg 3279.*

Pinus monticola and *Pinus albicaulis* have been reported from southern California, but I have not seen any specimens, and their presence within our range is doubtful.

3. Pinus quadrifolia Parry; Parl. in DC. Prod. **16**, pt. 2: 402. 1868.

Pinus parryana Engelm. Am. Journ. Sci. II. **34**: 332. 1862. Not Gord. 1858.

Type locality: "On the mountains east of San Diego."

Distribution: Parry's pine occupies a belt on the mountains of northern Lower California corresponding to that of *P. monophylla* on the mountains bordering the Mohave Desert. It extends northward, sparingly, along the desert slope to the Santa Rosa Mountains of southern California. Upper Sonoran.

Specimens examined: Coyote Canyon, Santa Rosa Mountains, *Leiberg 3164; Hall 2139;* mountains east of San Diego, *Parry*, 1850; near Walker's ranch, between Campo and Jacumba Hot Spring, *Vasey*, 1880.

4. Pinus monophylla Torr. & Frem. in Frem. Second Rep. 319, *pl. 4.* 1845.

Pinus Fremontiana Endl. Syn. Conif. 183. 1847, in part.

Type locality: "Extensively diffused over the mountains of northern California from long. 111° to 120°, and through a considerable range of latitude."

Distribution: The piñon is characteristic of the Great Basin district. It extends over the mountains of the Great Basin, ranging westward to the eastern slopes of the Sierra Nevada and southward along the desert slopes of the southern California mountains to the northern border of Lower California. In southern California the piñon forms a distinct belt along the northern slopes of the San Gabriel and the San Bernardino Mountains, ranging from 1000 to 1500 meters in altitude. South of the San Bernardino Mountains it becomes rare and finally is superseded by *P. quadrifolia* near the Mexican boundary. Upper Sonoran.

Specimens examined: Mount Pinos, *Elmer 3983;* near the Frazier Borax Mine, Mount Pinos, *Abrams & McGregor 269;* Mutau Flat, head of Piru Creek, *Abrams & McGregor 186;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 669;* between Bear Valley and Cushenberry Spring, *Abrams 2136;* Morongo King

Mine, San Bernardino Mountains, *Parish 3456;* eastern slope of Mount San Jacinto, 800 meters, *Leiberg 3163.*

5. Pinus Torreyana Parry, Bot. Mex. Bound. 210, *pl. 58, 59.* 1859.

Pinus lophosperma Lindl. Gard. Chron. **1860**: 46. 1860.

Type locality; "Bluffs near the mouth of Solidad Creek, 10 miles north of San Diego, California."

Distribution: The Del Mar or Torrey pine has the most restricted range of any pine in North America. It extends along the coast in the vicinity of Soledad River, San Diego County, for about 8 miles and inland 2 or 3 miles. In addition to this one locality it has been found only on the east end of Santa Rosa Island. Upper Sonoran or Lower Sonoran.

Specimens examined: Santa Rosa Island, *Blanche Trask*, Oct. 1900; Soledad, *Pringle*, April 26, 1882; *Dudley*, July 24, 1899.

6. Pinus ponderosa Dougl.; Lawson, Man. Agr. 354. 1836.

Type locality: Washington, on the Spokane River, according to Piper.

Distribution: The western yellow pine is the most characteristic tree of the Western Arid Area of the Transition Zone, extending from British Columbia southward to western New Mexico and southern California. In southern California this pine is common throughout the Transition Zone of all the mountain ranges.

Specimens examined: Water Canyon, Tehachapi Mountains, *Abrams & McGregor 478;* Tejon Pass, *Coville & Funston 1223;* Santa Ana Canyon, San Bernardino Mountains, altitude 1500 meters, *Abrams & McGregor*, July 14, 1908.

6*a*. Pinus ponderosa Jeffreyi (Murray) Vasey, Rep. Com. Agr. **1875**: 179. 1876.

Pinus Jeffreyi Murray, Rep. Bot. Exped. Oreg. 2, *pl. 1.* 1853.
Pinus deflexa Torr. Bot. Mex. Bound. 209. 1859.

Type locality: "Shasta Valley, N. California."

Distribution: Cascade Mountains of southern Oregon southward through the Sierra Nevada and southern California to San Pedro Martir. The separation of this pine from typical *Pinus ponderosa* is often difficult in southern California. Some trees with plated bark have small cones, and others have cones fully as large as any of the variety. Both extremes also occur on trees with the darker furrowed bark. In almost any locality, but especially in the vicinity of Green Valley, San Bernardino Mountains, it is possible to gather a series of cones ranging in size from the typical to that of the variety.

Specimens examined: Mount Pinos, *Abrams & McGregor 241;* Mount San Gorgonio, *Dutton*, 1897; mountains east of San Diego, *Parry*, 1850.

7. PINUS SABINIANA Dougl. Trans. Linn. Soc. **16**: 749. 1833.

Type locality: Indefinite, but probably from the mountains near San Juan Mission, Monterey County. Douglas forwarded his paper in which this species was described from this place.

Distribution: The digger pine is characteristic of the Intramontane District, occupying a distinct belt below the Sierran District on the western slope of the Sierra Nevada, and on the inner Coast Ranges. A few trees penetrate through Tejon Pass and extend southward along the western margin of Antelope Valley to Elizabeth Lake, Liebre Mountains. Upper Sonoran.

Specimens examined: Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 399.*

8. PINUS COULTERI Lamb. in Don, Trans. Linn. Soc. **17**: 440. 1837.

Pinus macrocarpa Lindl. Bot. Reg. Misc. 61. 1840.

Pinus Sabiniana Coulteri Don; Loud. Arb. et Fruti. **4**: 2250. 1838.

Type locality: "On the mountains of Santa Lucia near the Mission of San Antonio, in latitude 36°, within sight of the sea and at an elevation of from 3000 to 4000 feet above the sea."

Distribution: Coulter's pine occurs in the Coast Ranges of California from the vicinity of Mount Diablo south to the Cuiamaca Mountains. In southern California it is scattered, usually sparingly, through the coniferous forests of the San Gabriel, the San Bernardino, the San Jacinto and the Cuiamaca Mountains. In the latter range it forms considerable forest around Julian. Transition.

Specimens examined: La Cumbre Peak, Santa Ynez Mountains, *Abrams 4315;* Deep Creek, San Bernardino Mountains, *Abrams 2067;* The Pines, Santa Ana Canyon, San Bernardino Mountains, *Abrams & McGregor 811;* Santa Ana Mountains, near Elsinore, *Dutton*, 1897; near Julian, Cuiamaca Mountains, *Vasey*, June, 1880.

9. PINUS MURRAYANA Balfour, Rep. Bot. Exped. Oreg. 2, *pl. 3, f. 2.* 1853.

Pinus contorta Murrayana Engelm. Bot. Calif. **2**: 126. 1880.

Type locality: "On the Siskiyou Mountains."

Distribution: The lodge-pole pine extends from southern Alaska south and east to southern Colorado and Utah, and on the Pacific Coast along the higher altitudes of the mountain ranges to Mt. San Pedro Martir, Lower California. In southern California it is confined to the Canadian Zone, seldom being found below 2400 meters.

Specimens examined: North Baldy, San Gabriel Mountains, *Abrams & McGregor 624;* Mount San Antonio, *Abrams 1946;* Bear Valley, San Bernardino Mountains, *Abrams 2080;* Mount San Gorgonio, *Leiberg 3280; Abrams & McGregor 781.*

10. PINUS ATTENUATA Lemmon, Gard. & Forest **5**: 65. 1892.

Pinus californica Hartw. Journ. Hort. Soc. **2**: 189. 1847. Not Loisel. 1812.

Pinus tuberculata Gord. Journ. Hort. Soc. **4**: 218. 1849. Not Don. 1837.

Type locality: "To the south of Monterey, in lat. 36°, near the level of the sea, and growing almost to the beach." The locality given here is that for *P. tuberculata*, since *P. attenuata* was based upon that species.

Distribution: The knob-cone pine extends from Mackenzie River, Oregon to the San Bernardino Mountains. In southern California it is limited to a narrow belt along the southern slope of the San Bernardino Mountains in the vicinity of the City Creek Canyon. Upper Sonoran.

Specimens examined: San Bernardino Mountains, on the City Creek road, altitude 875 meters, *Abrams 2802.*

2. PSEUDOTSUGA. Douglas fir.

1. Pseudotsuga macrocarpa (Torr.) Mayr. Wald. Nordam. 278. 1890.

Abies Douglasii macrocarpa Torr. Ives Rep. 28. 1861.
Abies macrocarpa Vasey, Gard. Monthly **1876**: 22. 1876.
Pseudotsuga Douglasii macrocarpa Engelm. Bot. Calif. **2**: 120. 1880.

Type locality: "Mountains near San Felipe," San Diego County.

Distribution: The big-cone spruce is the most characteristic tree of southern California. It occupies the upper altitudes of the Upper Sonoran on the coastal slope and extends into the lower parts of the Transition Zone. It occurs in the Santa Ynez Mountains, and in the vicinity of Fort Tejon extends southward to San Pedro Martir Mountain.

Specimens examined: La Cumbre Peak, Santa Ynez Mountains, *Abrams 4314;* Fort Tejon, *Abrams & McGregor 301;* Topatopa Mountains, *Abrams & McGregor 81;* Mount Wilson, San Gabriel Mountains, *Abrams*, July, 1906; Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 706;* Mount Santiago, Santa Ana Mountains, *Helen D. Geis*, 1903.

3. ABIES. Fir.

1. Abies concolor Lindl. & Gord. Journ. Hort. Soc. **5**: 210. 1850.

Picea concolor Gord. Pinetum 155. 1858.

Type locality: "On the mountains of New Mexico."

Distribution: Mountains of southern Oregon south to Mount San Pedro Martir, and extending eastward over the mountains of Nevada, Utah, western Colorado, and northern Arizona and New Mexico. In southern California the white fir is one of the common components of the coniferous forests especially in the upper half of the Transition Zone.

Specimens examined: Mount Pinos, *Elmer 4198; Abrams & McGregor 254;* Mount San Antonio, San Gabriel Mountains, *Abrams*, July, 1901; Strawberry Valley, San Jacinto Mountains, *Leiberg 3139*.

CUPRESSACEAE. Cypress Family.

Monoecious; cone-scales woody.
  Leaves in whorls of 4; cones and scales oblong. 1. *Heyderia.*
  Leaves opposite; cones globose; scales peltate. 2. *Cupressus.*
Dioecious; leaves opposite; cones berry-like, their scales becoming fleshy. 3. *Juniperus.*

1. HEYDERIA. Incense cedar.

1. Heyderia decurrens (Torr.) K. Koch, Dendrol. **2**: 177. 1873.

Libocedrus decurrens Torr. Pl. Frem. *pl. 3.* 1854.

Type locality: "Upper waters of the Sacramento, particularly from lat. 38° 40′ to about 41° N. lat."

Distribution: The post or incense cedar extends from the Santiam River in the southern Cascade Mountains southward through the Sierran District, of which it is one of the most characteristic trees. The southern limit, as that of so many of the trees peculiar to the Sierran District, is Mount San Pedro Martir, Lower California. Transition.

Specimens examined: Rock Creek Canyon, San Gabriel Mountains, *Abrams & McGregor 574;* Huston's Flat, San Bernardino Mountains, *Shaw*, Aug. 1900; Strawberry Valley, San Jacinto Mountains, *Leiberg 3149;* Cuiamaca Mountains, near Talley's ranch, *Palmer 3;* Laguna, *Mearns 3653.*

2. CUPRESSUS. Cypress.

1. Cupressus guadalupensis S. Wats. Proc. Am. Acad. **14**: 300. 1879.

Cupressus macrocarpa guadalupensis Masters, Journ. Linn. Soc. **31**: 343. 1896.

Type locality: "On Guadalupe Island, off the coast of Lower California."

Distribution: A small grove of cypress near the Jamul Valley, San Diego County, seems to belong to this insular species.

Specimens examined: Cypress canyon, between Oneonta and Dulgura, *Forbes*, Dec. 3, 1907.

3. JUNIPERUS. Juniper.

Seeds 1 or 2; cotyledons 4–6.
  Leaves rounded at the apex, conspicuously glandular on the back. 1. *J. californica.*
  Leaves acute or acuminate, glandless. 2. *J. utahensis.*
Seeds 2 or 3; cotyledons 2; leaves conspicuously glandular on the back. 3. *J. occidentalis.*

1. Juniperus californica Carr. Rev. Hort. IV. **3**: 352, *f. 21.* 1854.

Juniperus tetragona osteosperma Torr. Pacif. R. Rep. **4**: 141. 1857.
Sabina californica Antoine, Cupress. Gatt. 52, *pl. 71, 72.* 1857.

Type locality: "En Californie."

Distribution: The California juniper is characteristic of the desert slopes of the mountains extending from the southern Sierra Nevada to Lower California. It also occurs in the more arid parts of the Great Valley, and on dry washes on the coastal slope in southern California. Upper and Lower Sonoran.

Specimens examined: Ten Sycamore Flat, Sespe Creek, *Abrams & McGregor 168;* Fort Tejon, *Abrams & McGregor 302;* Palmdale, *Elmer 3633;* Big Tejunga Wash, San Fernando Valley, *Abrams 1374;* Rock Creek, San Gabriel Mountains, *Abrams & McGregor 531;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 618;* Cajon Pass, *Coville & Funston 125;* Morongo Canyon, *Parish 2985;* near Mentone, *Abrams & McGregor 824;* San Felipe Canyon, *Palmer 17;* San Jacinto Moutains, *Leiberg 3159;* Jacumba Hot Spring, *Abrams 3648, 3649.*

2. Juniperus utahensis (Engelm.) Lemmon, Rep. Calif. State Board Forest. **3**: 183, *pl. 28, f. 2.* 1890.

Juniperus californica utahensis Engelm. Trans. St. Louis Acad. **3**: 588. 1877.
Juniperus occidentalis utahensis Veitch, Man. Conif. 289. 1881.

Type locality: "All over the southern parts of Utah and into Arizona and Nevada."

Distribution: Western Colorado and Utah to northern Arizona and the eastern limits of the Mohave Desert, where it occurs within our range on the Providence Mountains. (See introduction.) Upper Sonoran.

Specimens examined: Providence Mountains, *Brandegee*, May 26, 1902.

3. Juniperus occidentalis Hook. Fl. Bor. Am. **2**: 166. 1838.

Type locality: "Common on the higher parts of the Columbia."

Distribution: This juniper extends from western Idaho and eastern Washington southward along the Cascade Mountains and the Sierra Nevada to the San Jacinto Mountains. In southern California it is found in the vicinity of Bear Valley, and toward the summits of Mount San Antonio and Mount San Jacinto, occupying an arid belt intermediate between the Transition and the Canadian Zones.

Specimens examined: Bear Valley, San Bernardino Mountains, *Leiberg 3316; Abrams*, Aug. 3, 1901.

GNETACEAE. Joint-fir Family.

1. EPHEDRA. Mexican tea.

Scales and bracts in 2's.	
Branches bright green, erect and broom-like.	1. *E. viridis.*
Branches pale glaucous green, divergent.	2. *E. nevadensis.*
Scales and bracts in 3's.	3. *E. californica.*

1. Ephedra viridis Coville, Contr. Nat. Herb. **4**: 220. 1893.

Type locality: "Near Crystal Spring, Cosco Mountains, Inyo County, California."

Distribution: Western slopes of the Mohave Desert eastward to southern Nevada. This species is characteristic of the piñon belt on the mountain slopes of the Mohave Desert. Upper Sonoran.

Specimens examined: Frazier Borax Mine, Mount Pinos, *Abrams & McGregor 216, 217;* Ten Sycamore Flat, Sespe Creek, *Abrams & McGregor 174;* near Bear Valley, *Leiberg 3315;* Cushenberry Spring, *Parish 4980;* Rose Mine, San Bernardino Mountains, *Parish 2975.*

2. Ephedra nevadensis S. Wats. Proc. Am. Acad. **14**: 298. 1879.

Type locality: "Pah Ute Mountains, altitude 5000 feet; Carson City, altitude 5000 feet."

Distribution: Nevada and Utah southward through the desert regions to Lower California. In southern California this species is characteristic of the juniper and the yucca belts of the deserts. Upper and Lower Sonoran.

Specimens examined: Mohave Desert, near Varren Station, *Abrams & McGregor 499;* near Acton, *Elmer 3599*; Jacumba Hot Spring, *Abrams 3676;* Mountain Spring, *Mearns 3079.*

3. Ephedra californica S. Wats. Proc. Am. Acad. **14**: 300. 1879.

Type locality: "Promontory near San Diego, and Jamul Valley."

Distribution: The Mohave Desert, southward to Lower California, extending westward to the coast in the vicinity of San Diego and southward. Lower Sonoran.

Specimens examined: Between Victor and Stoddard Wells, *Coville & Funsten 159;* Whitewater, *S. B. & W. F. Parish 653;* eastern slope of San Gorgonio Pass, *Leiberg 3234;* Coyote Canyon, Santa Rosa Mountains, *Hall 2863;* Jacumba Hot Spring, *Mearns 3332;* Campo, *Abrams 3600;* North Coronado, *Knapp*, 1895; Tia Juana, *Abrams 3489.*

PHOENICACEAE. Palm Family.

1. NEOWASHINGTONIA. California fan-palm.

1. Neowashingtonia filamentosa Sudworth, U. S. Dept. Agr. Div. Forest. Bull. no 14: 105. 1897.

Pritchardia filamentosa Wendl. Bot. Zeit. **34**: 807. 1876.
Pritchardia filifera Linden, Ill. Hort. 24. 1877.
Washingtonia filifera Wendl. Bot. Zeit. **37**: 68. 1879.
Washingtonia filamentosa Kuntze, Rev. Gen. Pl. **2**: 737. 1891.

Type locality: Described from young plants cultivated in Europe. The source of the seeds is not definitely known.

Distribution: The California fan-palm occurs in a few scattered groves along the base of the desert ranges a few miles north of Indio, and again at Palm Springs on the eastern base of Mount San Jacinto. An interesting account, and an exhaustive bibliography of the genus, was given by Parish in the Botanical Gazette, Dec., 1907.

Specimens examined: Palm Springs, *Dudley*, Dec. 1902.

LILIACEAE. Lily Family.

Flowers polygamo-dioecious; perianth-segments 1-nerved; filaments filiform; fruit thin and membranous, bursting irregularly. 1. *Nolina.*
Flowers perfect; perianth-segments many-nerved; filaments clavate; fruit a thick-walled capsule, or baccate, septicidal or loculicidal.
  Style filiform; stigma capitate, long-papillate. 2. *Hesperoyucca.*
  Style stout or wanting, 6-notched, openly perforate.

Perianth-segments thick; nectar glands small; style wanting.
3. *Cleistoyucca.*
Perianth-segments thin; nectar glands large; style evident.
4. *Yucca.*

1. NOLINA.

1. Nolina Parryi S. Wats. Proc. Am. Acad. **14**: 247. 1879.

Type locality: "California (western border of the San Bernardino Desert); Parry, 1876."

Distribution: Desert slopes of the San Bernardino and the San Jacinto Mountains on the western border of the Colorado Desert. Lower Sonoran.

Specimens examined: Rattlesnake Canyon, San Bernardino Mountains, *Parish 3145;* Tahquitz Valley, San Jacinto Mountains, altitude 2000 meters, *Hall 2432;* Southeastern base of Mount San Jacinto, altitude 1500 meters, *Hall 1819;* San Felipe, *Brandegee*, April 30, 1894.

2. HESPEROYUCCA. Spanish bayonet.

1. Hesperoyucca Whipplei (Torr.) Baker, Kew Bull. **1892**: 8. 1892.

Yucca Whipplei Torr. Bot. Mex. Bound. 222. 1859.
Yucca graminifolia Wood, Proc. Acad. Philad. **1868**: 167. 1868.
Yucca Whipplei graminifolia Baker, Journ. Linn. Soc. **18**: 230. 1880.

Type locality: "Near San Pasqual, southern California."

Distribution: Monterey County and the southern Sierra Nevada southward to the vicinity of Alamo, Lower California. In southern California the Spanish bayonet is common throughout the chaparral covered areas of the coast slope; it also occurs in the piñon belt of the desert slopes. A purple flowered form was collected by the writer (*3547*) in the foothills of San Diego County. In the vicinity of Fort Tejon (*Abrams & McGregor 270*) a more compact form, with flowers scarcely half the normal size, grows associated with typical plants.

Specimens examined: Soldiers Camp, near Fort Tejon, *Abrams & McGregor 270, 271;* Sulphur Mountain Spring, *Abrams & McGregor 41;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2564;* Cajon Pass, *Bigelow*, 1853; San Pasqual, *Schott;* near Dulzura, *Abrams 3547*.

3. CLEISTOYUCCA. Joshua tree.

1. Cleistoyucca arborescens (Torr.) Trelease, Rep. Mo. Bot. Gard. **13**: 41. 1902.

Yucca draconis arborescens Torr. Pacif. R. Rep. **4**: 147. 1857.
Yucca brevifolia Engelm. King Exped. **5**: 496. 1871. Not Schott. 1859.
Yucca arborescens Trelease, Rep. Mo. Bot. Gard. **3**: 163. 1892.

Type locality: "Sandy and gravelly plains west of the Colorado, California."

Distribution: Mohave Desert of southern California east and north to southern Nevada, northeastern Arizona, and southwestern Utah. It forms orchard-like groves between the juniper and Covillea belts. Lower Sonoran.

Specimens examined: Desert slopes of the Tehachapi Mountains, near Willow Springs, *Abrams & McGregor 430.*

4. YUCCA. Yucca.

1. Yucca mohavensis Sargent, Gard. & For. **9**: 104. 1896.

Type locality: "Most abundant and grows to its largest size on the Mohave Desert."

Distribution: Northwestern Arizona and southwestern Nevada westward through the Mohave Desert and southward along the western border of the Colorado Desert to northern Lower California, where it extends westward into the coastal region in the vicinity of San Diego. This species is said to have been collected by Parry near Monterey, but we strongly suspect that this is an error through confusion of labels. Parry's plants in all probability came from San Diego, for so far as we are aware the plant has not been found in the coastal region north of this locality.

Specimens examined: San Dieguito (Bernardo), *Abrams 3409;* San Diego, *Jones 3163;* San Timotea Canyon, *Hall 5751;* western base of Mount Santa Rosa, *Hall 1905.*

SALICACEAE. Willow Family.

Stamens numerous, bracts fimbriate or lacerate.	1. *Populus.*
Stamens 1–5; bracts entire or denticulate.	2. *Salix.*

1. POPULUS. POPLAR OR COTTONWOOD.

Petioles terete; ovary tomentose. 1. *P. trichocarpa.*
Petioles flattened; ovary glabrous.
  Leaves coarsely serrate-dentate; capsules globose; stigma-lobes dilated. 2. *P. Fremontii.*
  Leaves finely crenate-serrate; capsules oblong-conic; stigma-lobes linear. 3. *P. tremuloides.*

1. POPULUS TRICHOCARPA Torr. & Gray; Hook. Ic. Pl. **9**: *pl. 878.* 1852.

Type locality: "Santa Clara River, near Beneventano [Ventura], California."

Distribution: British Columbia and western Montana, southward throughout California. The mountain forms often develop narrow leaves that approach *P. angustifolia*, but there seem to be no stable characters that warrant their separation as a distinct variety or species. In southern California this species occurs in the Upper Sonoran on the coastal slope, and in the Transition and the lower altitudes of the Canadian Zones. In the Lower Sonoran of the interior valleys, at San Diego, and on the deserts, it is replaced by *P. Fremontii.*

Specimens examined: Sulphur Mountain Spring, near Santa Paula, *Abrams & McGregor 58;* Monrovia Canyon, San Gabriel Mountains, *Dudley*, Nov. 20, 1907; Bear Valley, San Bernardino Mountains, *Abrams & McGregor 738.*

2. POPULUS FREMONTII S. Wats. Proc. Am. Acad. **10**: 350. 1875.

Type locality: "On Deer Creek at 'Lassen's' in the upper Sacramento Valley."

Distribution: Sacramento Valley south to northern Lower California, and eastward to southern Colorado and western Texas. In southern California this species occurs along most of the streams of the interior valleys, approaching the coast in San Diego County; it is also abundant in the canyons on the desert slopes of all the mountains. A form with pubescent twigs, foliage, and peduncles, which occurs on the delta of the Colorado River, may prove worthy of recognition when more complete material is at hand. My own specimens from Elsinore Lake are fully as pubescent as the delta plants, but specimens from Cajon Pass (*Abrams & McGregor 695*) are only sparsely so, thus approaching the typical form which is glabrous.

Specimens examined: Elizabeth Lake, Liebre Mountains, *Abrams & McGregor 412;* Rock Creek, San Gabriel Mountains, *Abrams & McGregor 556;* near Claremont, *Baker 5347;* Cajon Pass, *Abrams & McGregor 695;* San Bernardino, *Parish*, March, 1902; San Dieguito River, near San Dieguito (Bernardo), *Abrams 3370;* Calexico, *G. D. Abrams*, Feb., 1910.

3. POPULUS TREMULOIDES Michx. Fl. Bor. Am. **2**: 243. 1803.

Type locality: "Hab. in Canada et Noveboraco."

Distribution: The quaking aspen is distributed through the Canadian Zone of California, and extends from San Pedro Martir northward to Alaska, thence across the northern part of the continent, ranging southward along the mountains to New Mexico and Pennsylvania. Only one locality has been discovered in southern California, viz., Grinnell (Univ. Calif. Pub. Zoology **5**: 34. 1908) reports several groves "on the west side of the upper Fish Creek Canyon, north of San Gorgonio Peak, at altitudes of 7000 to 7600 feet."

2. SALIX. WILLOW.

- Stamens 3 or more; bark furrowed; trees.
  - Leaves green on both surfaces; stipules glandular; ovary often pubescent. 1. *S. vallicola.*
  - Leaves pale beneath; capsule glabrous.
    - Petioles with glands near the base of the blade; stipules conspicuous, glandular. 2. *S. lasiandra.*
    - Petioles and stipules not glandular, the latter often wanting. 3. *S. laevigata.*
- Stamens 2; bark not furrowed; trees or shrubs.
  - Scales of the ament black or black-tipped.
    - Ovary and capsule glabrous.
      - Leaves entire or remotely and obscurely serrate, becoming rusty-glaucous beneath; scales pubescent or short-villous. 4. *S. lasiolepis.*
      - Leaves finely serrate, becoming smooth and pale beneath; scales long-villous. 5. *S. Watsoni.*
    - Ovary and capsule pubescent.
      - Aments appearing before the leaves; styles none. 6. *S. Scouleriana.*
      - Aments appearing with the leaves; styles evident. 7. *S. glaucops.*
  - Scales of the ament pale.
    - Ovary glabrous; leaves sparsely appressed-pubescent. 8. *S. exigua.*
    - Ovary pubescent at least sparsely so when young; leaves more or less densely silky. 9. *S. argophylla.*

1. **Salix vallicola** (Dudley) Britton, N. Am. Trees 184. 1908.
Salix nigra vallicola Dudley in Abrams, Fl. Los Angeles 100. 1904.

Type locality: "Along the Santa Ana River near Orange," California.

Distribution: Streambanks in the Sacramento and San Joaquin valleys, southward into southern California. This variety differs from the true *Salix nigra* in its glandular stipules, and obovate or rounded instead of ovate bracts of the staminate aments. Specimens from the Colorado Desert (*Abrams 3195*) have the bracts of the staminate aments glandular-toothed. There are other evidences that this desert plant is distinct from the coast species, but more material is needed to satisfactorily determine its relationship. Upper and Lower Sonoran.

Specimens examined: Gorman's Station, Antelope Valley, *Abrams & McGregor 314;* Santa Ana River, near Orange, *Abrams 3256;* near Santa Ana, *Helen D. Geis;* Elsinore, *Baker 4146;* San Dieguito River, *Abrams 3371;* San Diego River, San Diego, *Abrams 3410;* Tia Juana, *Abrams 3484;* Blue Lake, Imperial County, *Abrams 3195.*

2. **Salix lasiandra** Benth. Pl. Hartw. 335. 1857.

Type locality: "Ad flumen Sacramento."

Distribution: Southwestern British Columbia and western Washington and Oregon, southward to southern California. Upper Sonoran and Transition.

Specimens examined: Los Angeles River, near Tropico, *Abrams 1449;* Pasadena, *Grant 1160;* vicinity of San Bernardino, *Parish 4635, 4677;* Bear Valley, San Bernardino Mountains, *Abrams & McGregor 739.*

3. **Salix laevigata** Bebb. Am. Nat. 8: 202. 1874.

Type locality: "California, at Santa Cruz, also 'Ukiah' and Alameda Co."

Distribution: Siskiyou County south to the northern part of Lower California. In southern California this species is frequent along the principal streams. Upper Sonoran and Transition.

Specimens examined: Sulphur Mountain Spring, near Santa Paula, *Abrams & McGregor 60;* Topatopa Mountains, *Abrams & McGregor 121;* Los Angeles River, near Rivera, *Abrams 3253;* Ballona Creek, near Mesmer, *Abrams 1467;* near Chatsworth, *Abrams 1362;* Santa Ana, *Helen D. Geis 554;* Cosey Dell, Cajon Pass, *Abrams & McGregor, 693;* West Fork of Mohave River, *Abrams & McGregor 722;* Jamul Valley, *Susan G. Stokes*, July, 1895; near El Nido, *Abrams 3541;* Campo, *Abrams 3615.*

4. SALIX LASIOLEPIS Benth. Pl. Hartw. 335. 1857.

Type locality: "Ad ripas fluviorum Salinas et Carmel prope Monterey."

Distribution: Klamath River, southward to the northern part of Lower California, also in southern Arizona. In southern California this is the most common willow in the valleys and foothills. A form occurs in the upper parts of the Transition Zone strikingly different in habit. It is a bush forming low round clumps. The leaves are much smaller and paler.

Specimens examined: Santa Barbara, *Elmer 3911;* Santa Ynez Mountains, *Elmer 3873;* Topatopa Mountains, altitude 1860 meters, *Abrams & McGregor 105;* Rock Creek, San Gabriel Mountains, *Abrams & McGregor 541;* Inglewood, *Abrams 3103;* vicinity of San Bernardino, *Parish*, May, 1899; Fish Creek, San Bernardino Mountains, *Grinnell 35.*

5. SALIX WATSONI (Bebb.) Rydb. Bull. Torr. Bot. Club **33**: 137. 1906.

Salix cordata Watsoni Bebb. Bot. Calif. **2**: 86. 1880.

Type locality: "Near Carson City (*Watson*), and in Sierra County, *Lemmon.*"

Distribution: Utah westward to the eastern slopes of the Sierra Nevada and southward to the San Jacinto Mountains.

Specimens examined: Tahquitz Creek, San Jacinto Mountains, *Hall 2447.*

6. SALIX SCOULERIANA Barratt; Hook. Fl. Bor. Am. **2**: 145. 1838.

Salix flavescens Nutt. N. Am. Sylva **1**: 65. 1842.

Salix Nuttallii Sarg. Gard. & Forest **8**: 463. 1895.

Type locality: "North West America, on the Columbia."

Distribution: Southern Assiniboia southward through the Rocky Mountains to northern New Mexico and Arizona, and along the Cascada Mountains and the Sierra Nevada to the San Bernardino Mountains. Transition.

Specimens examined: Faunskin Park, San Bernardino Mountains, *Parish 4994;* Snow Canyon, San Bernardino Mountains, *Parish 5047;* Deep Creek, San Bernardino Mountains, *Abrams & McGregor 729;* Bluff Lake, *Grinnell 100.*

7. SALIX GLAUCOPS Anderss. in DC. Prod. **16**, pt. 2: 281. 1858.

Salix glauca villosa Anderss. Sal. Bor. Am. 22. 1858.

Salix glaucops villosa Anderss. in DC. Prod. **16**, pt. 2: 281. 1858.

Type locality: "In omni America septentrionali usque ad fl. Saskatchawan crescere dicitur."

Distribution: British Columbia eastward to the Rocky Mountains and southward to New Mexico and southern California. Canadian Zone.

Specimens examined: Dollar Lake Canyon, altitude 2790 meters, *Hall 7667; Abrams & McGregor 767.*

8. SALIX EXIGUA Nutt. N. Am. Sylva **1**: 75. 1842.

Salix longifolia exigua Bebb. Bot. Calif. **2**: 85. 1880.

Type locality: "On the immediate border of the Oregon below its confluence with the Wahlamet."

Distribution: The Columbia Basin, eastward through the Great Basin region and southward to New Mexico. In California I have seen specimens from only the Imperial Valley, where it is often abundant along the main canals and channels leading from the Colorado River. Upper and Lower Sonoran.

Specimens examined: Near Calexico, *G.D. Abrams*, July, 1902.

9. SALIX ARGOPHYLLA Nutt. N. Am. Sylva **1**: 71, *pl. 20.* 1842.

Salix longifolia argophylla Anderss. in DC. Prod. **16**, pt. 2: 214. 1868.

Salix Hindsiana Benth. (?) Pl. Hartw. 335. 1857.

Salix Parishiana Rowlee, Bull. Torr. Bot. Club **27**: 249. 1900.

Salix macrostachya leucodermis Rowlee, Bull. Torr. Bot. Club **27**: 250. 1900.

Type locality: "On the Boise River, toward its junction with the Shoshonee," Idaho.

Distribution: Washington south through Oregon and California to northern Lower California, and extending eastward to the Rocky Mountains. Upper and Lower Sonoran.

Specimens examined: Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 406;* Jacumba Hot Spring, *Abrams 3679;* Ten Sycamore Flat, Sespe Creek, *Abrams & McGregor 169;* between Oakgrove Canyon & Elizabeth Lake, *Abrams & McGregor 406;* Inglewood, *Abrams 1493;* Cienega, *Abrams*, March, 1899; vicinity of San Bernardino, *Parish 4486;* Waterman Canyon, *Shaw & Illingsworth 4;* Cosey Dell, Cajon Pass, *Abrams & McGregor 694;* Santa Ana River, *Helen D. Geis 553;* Tia Juana River, *Herre*, Aug. 1902, *Abrams 3485;* San Diego River, San Diego, *Abrams 3419*.

MYRICACEAE. Bayberry Family.

1. MYRICA. Wax myrtle.

1. Myrica californica Cham. & Sch. Linnaea **6**: 535. 1831.

Type locality: "Legimus ad portum sancti Francisci Californiae."

Distribution: Moist, usually wooded slopes near the coast, from Puget Sound to the vicinity of Santa Monica. This species is most abundant in the Pacific Humid Area of the Transition Zone.

Specimens examined: Rustic Canyon, near Santa Monica, *Hasse*, May and July, 1890; *McClatchie*, Aug. 30, 1896.

JUGLANDACEAE. Walnut Family.

1. JUGLANS. Walnut.

1. Juglans californica S. Wats. Proc. Am. Acad. **10**: 349. 1875, excluding synonymy.

Type locality: "Vicinity of San Francisco growing 40–60 feet high and 2–4 feet in diameter, and ranging southward to Santa Barbara, Southern Arizona and Sonora."

Distribution: Ojai Valley, Ventura County, southward to the Santa Ana Mountains. It is most abundant on north slopes of the coastal mountains (Sulphur Mountain, Santa Monica Mountains, and Puente Hills) but extends eastward along the San Gabriel and the San Bernardino Mountains to the vicinity of San Bernardino. Upper Sonoran.

Specimens examined: Sulphur Mountain, *Abrams & McGregor 9;* Cahuenga Pass, *Abrams 1243;* Glendora, *Baker 5294;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 691*.

BETULACEAE. Birch Family.

1. ALNUS. Alder.

1. Alnus rhombifolia Nutt. N. Am. Sylva **1**: 33. 1842.

Type locality: "In the vicinity of Monterey, in Upper California."

Distribution: Idaho and eastern Washington south through the Sierra Nevada and the Coast Ranges to San Diego. In southern California the alder is most frequent along streams in the mountains from 400–1000 meters. On the coastal slope it sometimes extends along the streams well into the valleys, especially in the vicinity of Pasadena. On the desert slopes it extends down the principal streams to the juniper belt. Transition and Upper Sonoran.

Specimens examined: Sulphur Mountain Spring, near Santa Paula, *Abrams & McGregor 59;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 126;* Rock Creek, desert slope of the San Gabriel Mountains, *Abrams & McGregor 527;* Arroyo Seco, near Pasadena, *Grant 36.*

FAGACEAE. Beech Family.

Involucre 1-flowered; fruit an acorn.
  Staminate aments densely flowered, erect; cup of acorn conspicuously echinate. 1. *Pasania.*
  Staminate aments loosely flowered, drooping; cup of acorn scaly (in ours), not echinate. 2. *Quercus.*
Involucre 1–3-flowered, becoming a spiny bur in fruit. 3. *Castanopsis.*

1. PASANIA. Tan-bark oak.

1. Pasania densiflora (Hook. & Arn.) Oerst. in Kloeb. Vidensk. Meddel. 84. 1866.

Quercus densiflora Hook. & Arn. Bot. Beech. 391. 1841.

Type locality: "California." First collected by Douglas.

Distribution: The tan-bark oak extends from the Umqua Valley of southern Oregon southward through the Coast Ranges to Santa Barbara County, and on the western slopes of the Sierra Nevada as far south as Mariposa County. Transition.

Specimens examined: La Cumbre Peak, Santa Ynez Mountains, *Abrams 4316.*

1. QUERCUS. Oak.

Styles slender, elongated; nut tomentose within; cup-scales thin; leaves or their lobes bristle-tipped; wood reddish. (Black oaks.)
Acorns developing the second year.
Leaves deciduous, large, deeply lobed. 1. *Q. Kelloggii.*
Leaves evergreen, small, bright green and shiny beneath. 2. *Q. Wislizeni.*
Acorns developing the first year; leaves evergreen, pale beneath. 3. *Q. agrifolia.*
Styles short, dilated; scales thickened on the back; leaves seldom bristle-tipped; wood white. (White oaks.)
Acorns developing the second year; cups very thick; nuts tomentose within; leaves evergreen, tomentose beneath.
Leaves entire or spinose-toothed; branchlets not divaricate; acorns rounded at apex. 4. *Q. chrysolepis.*
Leaves coarsely spinose-toothed, undulate; branchlets rigid and divaricate; acorns pointed at apex. 5. *Q. Dunnii.*
Acorns developing the first year; nut glabrous within.
Leaves deciduous, more or less lobed; trees.
Leaves dark green above; deeply lobed or parted; cups deep; branchlets pendulous. 6. *Q. lobata.*
Leaves blue-green above, shallowly lobed; cups shallow; branchlets not pendulous. 7. *Q. Douglasii.*
Leaves evergreen.
Trees; leaves entire or shallowly lobed, not spinose-toothed. 8. *Q. Engelmanni.*
Shrubs; leaves usually more or less spinose-toothed.
Leaves nearly or quite glabrous above; twigs rusty-pubescent.
Cups saucer-shaped; scales thick and rounded on the back. 9. *Q. dumosa.*
Cup turbinate; scales thin. 10. *Q. turbinella.*
Leaves gray with a stellate-pubescence above; twigs grayish-pubescent. 11. *Q. Alvordiana.*

1. **Quercus Kelloggii** Newb. Pacif. R. Rep. **6**: 28, *f. 6.* 1857.
Quercus tinctoria californica Torr. Pacif. R. Rep. **4**: 138. 1857.
Quercus californica Cooper, Smiths. Rep. 261. 1858.

Type locality: "South and north of San Francisco in the Coast Mountains," and "between Fort Redding and Lassen's Butte, on the western slope of the Sierra Nevada."

Distribution: Southern Oregon southward through the Coast Ranges and the Sierra Nevada to San Pedro Martir, Lower California. In southern California the California black oak is confined to the coniferous forests of the mountains, and is a characteristic tree of the Transition Zone.

Specimens examined: Near the summit of Frazier Mountain, *Dudley 4469;* Water Canyon, Tehachapi Mountains, *Abrams & McGregor 480;* Rock Creek Canyon, San Gabriel Mountains, *Abrams & McGregor 604;* Swartout Valley, San Gabriel Mountains, *Abrams & McGregor 649;* Mill Creek Falls, San Bernardino Mountains, *Parish 5068;* Cuiamaca Mountains, *Susan G. Stokes*, July, 1895; *Abrams 3959.*

2. QUERCUS WISLIZENI A. DC. Prod. **16**, pt. 2: 67. 1864.

Quercus Wislizeni frutescens Engelm. in Bot. Calif. **2**: 99. 1880.
Quercus parvula Greene, Pittonia **1**: 40. 1887.

Type locality: Originally given as Mexican, but later corrected (Trans. St. Louis. Acad. **3**: 396. 1877) to "the American Fork of the Sacramento River," California.

Distribution: Southern slopes of Mount Shasta southward in the Coast Ranges and in the Sierra Nevada to San Pedro Martir Mountain. In southern California it occurs in the upper part of the chaparral belt of all the mountains. The shrubby form is the common type, but occasionally trees 20–25 feet high have been observed (Santa Ana Canyon, San Bernardino Mountains, and Swartout Valley, San Gabriel Mountains). Transition and Upper Sonoran.

Specimens examined; Santa Ynez Mountains, *Franceschi*, 1894; Cuddy's ranch, near Mt. Frazier, *Dudley 4366;* Mount Lowe, *Dudley*, July 20, 1896; Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 152;* Kings Canyon, Liebre Mountains, *Dudley 4346;* Swartout Valley, San Gabriel Mountain, *Abrams & McGregor 661;* Lytle Creek Canyon, *Hall 901;* Arrowhead grade, *Shaw and Illingsworth 16;* Santa Ana Canyon, San Bernardino Mountains, *Shaw & Illingsworth 155;* Spencer Valley, Cuiamaca Mountains, *Abrams 3875;* Cuiamaca Peak, *Abrams 3950;* Walker's ranch, near Jacumba Hot Spring, *Abrams 3697.*

3. QUERCUS AGRIFOLIA Nee, Anal. Cienc. Nat. **3**: 271. 1801.

Quercus oxyadenia Torr. Sitg. Rep. 172, *pl. 17.* 1853.
Quercus berberidifolia Liebm. Oversigt Dansk. Vidensk. 1854, 172. 1854.
Quercus arcoglandis Kell. Proc. Calif. Acad. **1**: 25. 1855.
Quercus agrifolia frutescens Engelm. Bot. Calif. **2**: 98. 1880.
Quercus agrifolia berberifolia Wenzig, Jahrb. Bot. Gart. Berlin **3**: 203. 1885.

Type locality: "I have only seen branches collected at Monterey and Nootka, by the marine officer Don Robredo, and Don Manuel Esquerra, paymaster of the corvette Atrevida." The above is copied from the translation of Nee's paper in the Annals of Botany (**2**: 106. 1806). The station "Nootka" must be erroneous.

Distribution: Mendocino County southward through the Coast Ranges to Mt. San Pedro Martir, Lower California. In southern California this oak is confined to the coast slope, even becoming very uncommon in the interior valleys. Its most eastern station is in the mountains between Campo and Jacumba Hot Spring, San Diego County. Upper Sonoran.

Specimens examined: Sespe Hot Springs, *Dudley 4781;* Switzer's Camp, San Gabriel Mountains, *Grinnell*, Oct. 8, 1908; near Julian, *Susan G. Stokes*, July, 1895; Alpine, Cuiamaca Mountains, *Mearns 3949, 4014.*

Quercus morehus Kell. This oak is apparently a hybrid between *Q. Kelloggii* and *Q. Wislizeni.* It is never found except in the vicinity of these species, and never in large numbers. Two trees have been discovered recently in southern California: between Swartout Valley and Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 666;* near Skinner's Camp, Mill Creek, San Bernardino Mountains, *Abrams & McGregor 819.*

4. QUERCUS CHRYSOLEPIS Liebm. Dansk. Vidensk. Forhandl. 1854, 173. 1854.

Quercus fulvescens Kell. Proc. Calif. Acad. **1**: 67. 1855.
Quercus crassipocula Torr. Pacif. R. Rep. **4**, pt. 1: 137. 1857.

Type locality: "California."

Distribution: Southern Oregon southward through the Coast Ranges and the western slope of the Sierra Nevada to San Pedro Martir Mountain. In southern California the canyon oak occurs in the lower part of the Transition Zone and extends into the Upper Sonoran along the canyons.

Specimens examined: Kings Canyon, Liebre Mountains, *Dudley 4364, 4430;* Water Canyon, Tehachapi Mountains, *Abrams & McGregor 431;* Frazier Mountain, *Dudley 4541*; Mount Wilson trail, San Gabriel Mountains, *Grinnell 90;* Talley's ranch, Cuiamaca Mountains, *Susan G. Stokes*, July, 1895.

Quercus tomentella Engelm. Trans. St. Louis Acad. **3**: 393. 1877. Foliage resembling that of *Pasania densiflora;* leaves oblong-ovate strongly nerved and tomentose beneath. Peculiar to the islands off the coast of southern California.

5. QUERCUS DUNNII Kell. Pacif. Rural Press. June 7, 1879.
Quercus Palmeri Engelm. in Bot. Calif. **2**: 97. 1880.
Quercus chrysolepis Palmeri Engelm. Trans. St. Louis Acad. **3**: 383. 1877.

Type locality: Not ascertained.

Distribution: Mountains of southern San Diego County southward into Lower California. This oak has been reported from Vandeventer's ranch, San Jacinto Mountains, otherwise it is known within the state only in the region where it was first discovered, which is a small grove about five miles west of Jacumba Hot Spring (Larken's Station). It probably belongs to the piñon belt of the Upper Sonoran.

Specimens examined: Walker's ranch, near Jacumba Hot Spring, *Abrams 3698.*

6. QUERCUS LOBATA Nee, Anal. Nat. **3**: 277. 1801.
Quercus Hindsii Benth. Bot. Sulph. 55. 1844.
Quercus lobata Hindsii Wenzig, Jahrb. Bot. Gart. Berlin **3**: 188. 1885.
Quercus longiglanda Torr. & Frem. in Frem. Geog. Mem. Upper Calif. 17. 1848.

Type locality: "Of this species I have only seen branches brought from Monterey by Sres. Robredo and Esquerra." The citation given here is copied from a translation of Nee's paper in Annals of Botany (**2**: 111. 1806).

Distribution: Valleys and low hills from the upper Sacramento southward to San Fernando Valley, Los Angeles County. In southern California the roble or valley oak does not occur south of the Santa Monica, Mountains except for a single tree near Santa Monica, and another young one near Lamanda Park. North of the Santa Monica Mountains it occurs in the San Fernando, Simi, Santa Clara, and Ojai Valleys. On the desert slopes of the mountains it enters our territory through Tejon Pass and extends along the western border of Antelope Valley to the vicinity of Elizabeth Lake, Liebre Mountains. Upper Sonoran.

Specimens examined: Canyon near Castac Lake, *Dudley 4469;* Soldier's Camp, near Fort Tejon, *Abrams & McGregor 273;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 825;* Water Canyon, Tehachapi Mountains, *Abrams & McGregor 492;* Chatsworth, *Abrams 1335.*

7. QUERCUS DOUGLASII Hook. & Arn. Bot. Beech. 391. 1841.

Quercus Ransomi Kell. Proc. Calif. Acad. **1**: 25. 1855.
Quercus oblongifolia brevilobata Torr. Bot. Wilkes Exped. 460. 1874.

Type locality: "California." First collected by Douglas.

Distribution: In the foothills and valleys of the Coast Ranges and Sierra Nevada from Mendocino County and the upper Sacramento Valley to the southern slopes of the Tehachapi Mountains. Upper Sonoran.

Specimens examined: Canyon above Castac Lake, *Dudley 4470,* Lebec Station, near Fort Tejon, *Abrams & McGregor 285.*

8. QUERCUS ENGELMANNI Greene, West. Am. Oaks 33, *pl. 15, f. 2, 3; pl. 17.* 1889.

Quercus MacDonaldi elegantula Greene, W. Am. Oaks, 26, *pl. 29.* 1890.

Type locality: "Mountains of southern California, from the mesas east of San Diego northward to Kern County."

Distribution: Valleys and low foothills in the vicinity of Pasadena southward through western San Diego County, and probably extending into Lower California. Hybrids between this species and *Q. dumosa* often occur. *Quercus MacDonaldi elegantula* was based upon one of these. Upper Sonoran.

Specimens examined: San Gabriel, *Engelmann,* Sept. 18, 1880; near Pasadena, *Grinnell,* Dec. 1903; Santa Anita, *Grinnell 126;* Sierra Madre, *Abrams 1490;* Fallbrook, *Parish,* Nov. 5, 1891; Potrero, *Orcutt 2209;* Alpine, *Mearns 3952.*

Quercus MacDonaldi Greene, W. Am. Oaks 25. 1889. A species peculiar to Santa Catilina Island. Small tree with foliage much like that of *Q. Douglasii.*

9. QUERCUS DUMOSA Nutt. N. Am. Sylva **1**: 7. 1842.

Quercus acutidens Torr. Bot. Mex. Bound. 207, *pl. 51.* 1859.
Quercus dumosa polycarpa Greene, West Am. Oaks pt. 2, *pl. 28.* 1890.

Type locality: "Entangled thickets over the base of the hills which flank the village of Santa Barbara."

Distribution: Coast Ranges from Lake County southward to northern Lower California, also on the western slope of the Sierra Nevada. In southern California this is the most common shrub in the chaparral belt of the coastal mountains, but less common in the interior. On the desert slopes of the mountains it is seldom met with, being mostly replaced by the next species. As here understood the species has a great number of forms or variations, both in foliage and fruit. Upper Sonoran.

Specimens examined: Mountain Drive, near Santa Barbara, *Abrams 4108;* head of Santa Clara Valley, *Rothrock 186;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 332;* Santa Monica Mountains *Hasse*, Dec. 1891; *Abrams 866, 1285, 1311;* Verdugo Hills, *Abrams 1419, 1420;* Arroyo Seco, near Pasadena, *Grinnell*, Dec. 22, 1908; Switzer's Camp, San Gabriel Mountains, *Grinnell*, Oct. 8, 1908; Sawpit Canyon, near Monrovia, *Dudley*, Dec. 27, 1907; San Antonio Canyon, *Baker 3684;* Cajon Pass, *Coville & Funston 115;* near Strawberry Valley, San Jacinto Mountains, *Leiberg 3113;* Santa Ana Mountains, near Elsinore, *Abrams*, July 21, 1908; San Joaquin Hills, near Laguna, *Abrams 1784;* San Dieguito (Benardo), *Abrams 3377;* near San Ysabel, *Henshaw 227;* San Diego, *Abrams 4014.*

10. QUERCUS TURBINELLA Greene, W. Am. Oaks 37, *pl. 27.* 1889.

Quercus dumosa turbinella Jepson, Fl. Calif. 356. 1909.

Type locality: "In the mountains of Lower California, where it is associated with the rare and characteristic *Q. dunnii* also within the borders of the State of California about Campo, in San Diego County."

Distribution: Inner South Coast Range from the Rancho Cantera southward to Frazier Mountain according to Jepson. I have seen no specimens of this species except from the vicinity of Campo, where it is very common in the chaparral-covered mountains which form the divide between the coast slope and the Colorado Desert. Upper Sonoran.

Specimens examined: Near Campo, *Abrams 3552, 3553; Meikle*, Nov. 1903.

11. Quercus Alvordiana Eastwood, Handb. Trees Calif. 48, *pl. 27, fig. 4.* 1905.

Type locality: "In the mountains connecting the Coast Range with the Sierra Nevada at the southern end of the San Joaquin Valley bordering the deserts."

Distribution: Desert slopes of the southern California mountains, extending from the Tehachapi Mountains southward into Lower California. This species may be only a form of *Q. pungens* to which it is certainly very closely related. Upper Sonoran.

Specimens examined: Frazier Borax Mine, Mount Pinos, *Abrams & McGregor 266;* Oriflamme Canyon, Cuiamaca Mountains, *Abrams 3935.*

3. CASTANOPSIS. Chinquapin.

1. Castanopsis sempervirens (Kell.) Dudley; Merriam, N. Am. Fauna, no. 16: 142. 1899.

Castanea sempervirens Kell. Proc. Calif. Acad. **1**: 75. 1855.

Type locality: "From the vicinity of Mariposa."

Distribution: Southern Cascade Mountains southward through the Sierra Nevada and the mountains of southern California, to the San Jacinto Mountains. In southern California it occupies a comparatively distinct belt in the border line between the Transition and Canadian Zones.

Specimens examined: North Baldy, *Abrams & McGregor 607;* Mount San Antonio, *Abrams 2712;* Mount San Gorgonio, altitude 3200 meters, *Abrams & McGregor 759.*

POLYGONACEAE. Buckwheat Family.

1. ERIOGONUM. Wild Buckwheat.

Involucres capitate or fascicled, in cymose-umbellate clusters; bracts foliaceous.
  Leaves orbicular to oblong, not fascicled.
    Peduncles elongated; flowers very villous. 1. *E. cinereum.*
    Peduncles short; flowers glabrous. 2. *E. parvifolium.*
  Leaves narrowly oblanceolate, often revolute, more or less fascicled.
    Perianth glabrous without; leaves nearly so. 3. *E. fasciculatum.*
    Perianth villous without.
      Leaves green and nearly glabrous above; involucres 3 mm. high. 3*a*. *E. fasciculatum foliolosum.*

Leaves hoary-tomentose above; involucres 4–5 mm. high.
3*b*. *E. fasciculatum polifolium.*

Involucres solitary, sessile along the branches; bracts not foliaceous.
  Involucres tomentose.
    Inflorescence virgately branched; branches slender becoming more or less denuded of tomentum. 4. *E. taxifolium.*
    Inflorescence with spreading, stout branches, permanently and densely white-tomentose. 5. *E. nodosum.*
  Involucres glabrous or nearly so; inflorescence intricately branched.
    Leaves densely tomentose; involucral teeth villous on the margins.
6. *E. Plumatella.*
    Leaves glabrate; involucral teeth glabrous.
7. *E. Heermanni.*

1. ERIOGONUM CINEREUM Benth. Bot. Sulph. 45. 1844.

Type locality: "San Pedro."

Distribution: Bluffs along the seashore and in the coastal foothills of southern California from the vicinity of Santa Barbara to San Pedro. Upper Sonoran.

Specimens examined: Ventura, *Hasse*, Sept. 15, 1888; Santa Monica, *Hasse*, Sept. 1889; *S. B. & W. F. Parish*, 1882; *Abrams 2193*.

2. ERIOGONUM PARVIFOLIUM Smith in Rees. Cycl. **13**. 1819.

Type locality: "California." First collected by Menzies, probably at Monterey.

Distribution: Seashore of California from Monterey to San Diego County. A common shrub on the sand-dunes. Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 3908, 4013; Abrams 4162;* Santa Monica, *Hasse*, 1894; Playa del Rey (Ballona Harbor), *Abrams 212;* Oceanside, *Parish 4446.*

3. ERIOGONUM FASCICULATUM Benth. Trans. Linn. Soc. **17**: 411. 1838.

Eriogonum rosmarinifolium Nutt. Journ. Acad. Philad. II. **1**: 164. 1847.

Eriogonum fasciculatum aspalathoides Gdgr. Bull. Soc. Bot. Belg. **42**: 189. 1906.

Eriogonum fasciculatum maritimum Parish, Muhlenbergia **3**: 59. 1907.

Type locality: "California."

Distribution: Santa Barbara southward to northern Lower California. Apparently most abundant about San Diego. Throughout the greater part of the coastal slope of southern California the typical form is replaced by the next. Upper and Lower Sonoran.

Specimens examined: Chollas Valley, *Susan G. Stokes*, July 21, 1901; Dulzura, *Susan G. Stokes*, July 17, 1901; San Diego, *Herre*, July 5, 1902; Tia Juana, *Abrams 3519*.

3*a*. **Eriogonum fasciculatum foliolosum** (Nutt.) Stokes.

Eriogonum rosmarinifolium foliolosum Nutt. Journ. Acad. Philad. II. **1**: 164. 1847.

Type locality: "Near Santa Barbara Upper California."

Distribution: A very common shrub in the lower altitudes of the chaparral belt on the coastal slope, extending from the vicinity of Santa Barbara to Lower California. Upper and Lower Sonoran.

Specimens examined: Mountain Drive, near Santa Barbara, *Abrams 4126;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 389* ("Growing with the variety *polifolium* and apparently not intergrading"); Pasadena, *Jones 3019;* Sierra Madre, *Abrams 2643;* San Gabriel Canyon, *Abrams 1048;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 679* (intermediate between this variety and the next); vicinity of San Bernardino, *Parish 538*; Banning, *Toumy*, Sept. 27, 1894; Santiago Canyon, Santa Ana Mountains, *Helen D. Geis 524;* Elsinore, *Mrs. J. D. Abrams*, May, 1901.

3*b*. ERIOGONUM FASCICULATUM POLIFOLIUM (Benth.) Torr. & Gray, Proc. Am. Acad. **8**: 169. 1870.

Eriogonum polifolium Benth. in DC. Prod. **14**: 12. 1857.

Type locality: "In Sierra Nevada, California (Fremont), and San Diego (Parry)."

Distribution: On the desert slopes of all the mountains of Southern California mostly within the piñon belt, and occasionally occurring in the more arid interior parts of the coast slope. Upper and Lower Sonoran.

Specimens examined: Vicinity of Fort Tejon, *Abrams & McGregor 291;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 134;* Willow Springs, Mohave Desert, *Abrams & McGregor 420;* Oakgrove Canyon, Liebre Mountains, *Abrams &*

McGregor 324; Rock Creek, desert slope of the San Gabriel Mountains, *Abrams & McGregor 549.*

4. Eriogonum taxifolium Greene, Pittonia **1**: 267. 1889.

Eriogonum Wrightii taxifolium Parish, Erythea **6**: 87. 1898.

Type locality: Cedros Island, "from a canyon on the eastern side, four miles below the northern end."

Distribution: San Jacinto Mountains southward to Cedros Island. Upper and Lower Sonoran.

Specimens examined: Cuiamaca Mountains, *Parry* 1850; *Allen*, 1897; *Miss Stokes*, Aug. 4, 1899; Jacumba Hot Spring (Larkens), *Palmer 343;* near Warner ranch, *Hayes*, Oct. 10, 1858; open pine forests in the vicinity of Strawberry Valley, San Jacinto Mountains, altitude 1700–2000 meters, *Hall 2608;* Hemet Valley, *Hall 755.*

5. Eriogonum nodosum Small, Bull. Torr. Bot. Club **25**: 48. 1898.

Type locality: "In dry soil, Don Cabesas, California."

Distribution: A desert species, known only from the original collection. Lower Sonoran.

6. Eriogonum Plumatella Dur. & Hilg. Pacif. R. Rep. **5**: 14, *pl. 16.* 1855.

Eriogonum Palmeri S. Wats. Proc. Am. Acad. **12**: 267. 1877.

Type locality: "Posa Creek," Kern County, California.

Distribution: Mohave Desert of southern California eastward to southern Utah. In southern California this species is characteristic of the yucca belt. Lower Sonoran.

Specimens examined: Desert slope of the Tehachapi Mountains between Tehachapi and Mohave, *Abrams & McGregor 497;* Palmdale, *Abrams & McGregor 515;* Rock Creek, edge of Mohave Desert, *Davidson*, Aug. 1, 1901; Mohave River, near the Hesperia, *Abrams 2165.*

7. Eriogonum Heermanni Dur. & Hilg. Pacif. R. Rep. **5**: 14, *pl. 17.* 1855.

Type locality: "Rose Creek," California.

Distribution: Western Nevada southward through the Piñon belt to Mount Pinos. Upper Sonoran.

Specimens examined: Frazier Borax Mine, Mount Pinos, altitude 1600 meters, *Abrams & McGregor 267*.

CHENOPODIACEAE. Goosefoot Family.

- Flowers unisexual.
  - Staminate flowers with 3–5-cleft perianth; pistillate flowers without perianth, enclosed in a pair of more or less united bracts.
    - Bracts compressed. 1. *Atriplex.*
    - Bracts obcompressed.
      - Pericarp glabrous, winged. 2. *Grayia.*
      - Pericarp hairy, not winged. 3. *Eurotia.*
  - Staminate flowers without perianth; pistillate with a saccate perianth. 6. *Sarcobatus.*
- Flowers perfect.
  - Leaves none; flowers immersed in the fleshy stems. 4. *Allenrolfea.*
  - Leaves terete; flowers not immersed in the stems. 5. *Dondia.*

1. ATRIPLEX. Salt-bush.

- Fruiting bracts without lateral wings.
  - Fruiting bracts without free diverging margins; leaves petioled.
    - Branches terete, flexuous (or slightly spinescent in no. 1).
      - Calyx-segments 5; bracts obscurely crenate. 1. *A. lentiformis.*
      - Calyx-segments 4; bracts entire. 2. *A. Breweri.*
    - Branches distinctly angled, the ultimate divaricate and spinescent; bracts denticulate. 3. *A. Torreyi.*
  - Fruiting bracts with free diverging margins.
    - Margins of bracts toothed, sides muricate. 4. *A. polycarpa.*
    - Margins of bracts entire, sides not muricate.
      - Leaves entire, sessile or nearly so.
        - Fruiting bracts 6–10 mm. long; leaves cuneate at base. 5. *A. confertifolia.*
        - Fruiting bracts 3 mm. long; leaves cordate at base. 6. *A. Parryi.*
      - Leaves coarsely toothed. 7. *A. hymenelytra.*
- Fruiting bracts with 4 broadly dilated lateral wings. 8. *A. canescens.*

1. Atriplex lentiformis (Torr.) S. Wats. Proc. Am. Acad. **9**: 118. 1874.

Obione lentiformis Torr. Sitg. Rep. 169, *pl. 14*. 1854.

Type locality: "On the Colorado of California."

Distribution: Upper San Joaquin Valley southward through the deserts of southern California, and Arizona to adjacent Mexico. Growing in heavy alkaline soil. Lower Sonoran.

Specimens examined: Imperial Valley, near Calexico, *G. D. Abrams*, Sept. 1902; Mountain Spring, *Palmer 328*.

2. ATRIPLEX BREWERI S. Wats. Proc. Am. Acad. **9**: 119. 1874.

Atriplex orbicularis S. Wats. Proc. Am. Acad. **17**: 377. 1882.

Type locality: "On the seashore at Santa Monica (Brewer) and Santa Barbara, Torrey."

Distribution: Bluffs and low places, especially in clay soil, along the seashore from Santa Barbara to northern San Diego County. Upper Sonoran.

Specimens examined: Santa Barbara *Torrey 459; Elmer 4016;* Ventura, *Hasse 4193;* Santa Monica, *Brewer*, Dec. 1860, *Abrams 2189.*

3. ATRIPLEX TORREYI S. Wats. Proc. Am. Acad. **9**: 119. 1874.

Obione Torreyi S. Wats. Bot. King Exped. 290. 1871.

Type locality: "In dry valleys bordering the Truckee and Carson Rivers," Nevada.

Distribution: Western Nevada and southern Utah to Antelope Valley, Mohave Desert, where it is common about Lancaster and Willow Springs. Lower Sonoran.

Specimens examined: Lancaster, *Wells*, Dec. 1909.

3. ATRIPLEX POLYCARPA (Torr.) S. Wats. Proc. Am. Acad. **9**: 117. 1874.

Obione polycarpa Torr. Pacif. R. Rep. **4**: 130. 1857.

Type locality: "Hills and gravely places, on William's River."

Distribution: Deserts of southern California eastward to Arizona. Lower Sonoran.

Specimens examined: Colorado Desert, *Pringle*, Oct. 24, 1882; *Emory*, Oct. 28, 1846.

4. ATRIPLEX CONFERTIFOLIA (Torr. & Frem.) S. Wats. Proc. Am. Acad. **17**: 119. 1874.

Obione confertifolia Torr. & Frem. Second Rep. 318. 1845.

Obione spinosa Moq. in DC. Prod. **13**, pt. 2: 108. 1849.

Atriplex spinosa Dietrich, Syn. Pl. **5**: 536. 1852.

Type locality: "On the borders of the Great Salt Lake."

Distribution: Southern Idaho and Wyoming south to New Mexico and northern Mexico, and eastward to the deserts of southern California. Growing in alkaline soil. Lower Sonoran.

Specimens examined: Lancaster, *Elmer 3691; Abrams & McGregor 511*, Willow Springs, *Abrams & McGregor 416.*

5. **Atriplex Parryi** S. Wats. Proc. Am. Acad. **17**: 378. 1882.

Type locality: "Near Colton, California." Parish (Zoe **5**: 113) states that "Dr. Parry's plant was collected at Lancaster, in the Mohave Desert."

Distribution: Mohave Desert, southern California. Lower Sonoran.

Specimens examined: Lancaster, *Elmer 3640; Wells*, Dec. 1909.

6. **Atriplex hymenelytra** (Torr.) S. Wats. Proc. Am. Acad. **9**: 119. 1874.

Obione hymenelytra Torr. Pacif. R. Rep. **4**: 129, *pl. 20*. 1857.

Type locality: "Hills and gravelly places, on Williams River."

Distribution: Southern Utah and Arizona westward to the desert slopes of the mountains of southern California. Growing in dry gravelly washes. Lower Sonoran.

Specimens examined: Near Bennett Wells, Death Valley, *Coville & Funston 195;* Signal Mountain, Colorado Desert, *Abrams*, Dec. 29, 1907; eastern slope of the Cuiamaca Mountains, *Emory* Nov. 28, 1846; near Mammoth Tank, *Parish*, Dec. 10, 1881.

7. **Atriplex canescens** (Pursh) Nutt. Gen. N. Am. Pl. **1**: 197. 1818.

Calligonum canescens Pursh, Fl. Am. Sept. **2**: 370. 1814.
Obione tetraptera Benth. Bot. Sulph. 48. 1844.

Type locality: "In the planes of the Missouri, near the Bigbend."

Distribution: Nevada and Colorado southward to New Mexico and Arizona, and westward to southern California, where it is especially common in the deserts. On the coast slope it occurs rather locally in the interior valleys toward the deserts, and in the vicinity of San Diego, mostly in dry subsaline places. Upper and Lower Sonoran.

Specimens examined: Ten Sycamore Flat, Sespe Creek, *Abrams & McGregor 167;* Lancaster, *Elmer 3647;* between Glendale and Burbank, *Braunton 906;* Cushenberry Spring, *Abrams 2150;* San Bernardino, *Parish*, May, 1900; near Redlands, *G. R. Hall*, 1904; San Jacinto Valley, *Hall 2003;* Encinitas, *McClatchie*, June, 1896; La Jolla, *Abrams 4012;* San Diego, *Parry*, 1850; *Palmer 327;* Calexico, *G. D. Abrams*, Sept., 1902.

2. GRAYIA.

1. Grayia spinosa (Hook.) Moq. in DC. Prod. **13**, pt. 2: 119. 1849.

Chenopodium spinosum Hook. Fl. Bor. Am. **2**: 127. 1838.
Grayia polygaloides Hook. & Arn. Bot. Beechy 388. 1841.

Type locality: "Interior of California, Nov. 1826; Mr. Douglas Snake country, Mr. Tolmie."

Distribution: Eastern Washington and Wyoming southward through the Great Basin to the Mohave Desert of southern California. Lower Sonoran.

Specimens examined: Near Willow Springs, *Abrams & McGregor 826;* Palmdale, *Elmer 3613*.

3. EUROTIA.

1. Eurotia lanata (Pursh) Moq. Chenop. Mon. Enum. 81. 1840.

Diotis lanata Pursh, Fl. Am. Sept. **2**: 602. 1814.

Type locality: "On the banks of the Missouri in open prairies."

Distribution: Eastern Washington and the Saskatchewan southward to New Mexico and southern California, where it is confined to the desert districts. Lower Sonoran.

Specimens examined: Desert slopes of the Tehachapi Mountains, near Willow Springs, *Abrams & McGregor 427;* Palmdale, *Elmer 3677; Abrams & McGregor 512;* near Barstow, *Hall 6164*.

4. ALLENROLFEA.

1. Allenrolfea occidentalis (S. Wats.) Kuntze, Rev. Gen. Pl. **2**: 546. 1891.

Halostachys occidentalis S. Wats. Bot. King Exped. **5**: 293. 1871.
Spirostachys occidentalis S. Wats. Proc. Am. Acad. **11**: 125. 1874.

Type locality: "About Great Salt Lake and in alkaline valleys westward to the sinks of the Carson and Humboldt Rivers, where it grows luxuriantly in large tracts that would be otherwise destitute of vegetation."

Distribution: Great Basin southward to western Texas and New Mexico and westward to California. In California this species occurs in very strong alkaline or saline places from Liver-more southward through the upper San Joaquin Valley and the deserts of southern California.

Specimens examined: Near Lancaster, *Abrams & McGregor 521.*

5. DONDIA.

1. **Dondia suffrutescens** (S. Wats.) Heller, Cat. N. Am. Pl. 3. 1898.

Suaeda suffrutescens S. Wats. Proc. Am. Acad. **9**: 88. 1874.

Type locality: "Western Texas to southern California and northern Mexico, in saline plains."

Distribution: Saline soils along the coast of southern California, eastward to western Texas. Very common in the Colorado Desert. Upper and Lower Sonoran.

Specimens examined: Long Beach, *McClatchie*, May 30, 1891; Chula Vista, *Abrams 4191;* North Island, Coronado, *Chandler 5185.*

6. SARCOBATUS.

Leaves glabrous or nearly so; body of fruit 8–9 mm. long. 1. *S. vermiculatus.*
Leaves pubescent with branched reflexed hairs; body of fruit 4–5 mm. long. 2. *S. Baileyi.*

1. **Sarcobatus vermiculatus** (Hook.) Torr. in Emory, Notes Mil. Reconnois. 150. 1848.

Batis vermiculata Hook. Fl. Bor. Am. **2**: 12. 1838.
Fremontia vermicularis Torr. in Frem. First Rep. 95. 1843.

Type locality: "Common on the barren grounds of the Columbia and particularly near salt marshes." First collected by Douglas.

Distribution: Alkaline places in eastern Washington and Oregon, and southward through the Great Basin to Arizona and the eastern parts of California. I have not seen any specimens of this species from our range, but it is common east of the Sierra Nevada about Owens Lake. Upper and Lower Sonoran.

2. **Sarcobatus Baileyi** Coville, Contr. Nat. Herb. **4**: 184. 1893.

Type locality: "In the valley near Thorpe's quartz-mill, Nye County, Nevada."

Distribution: Western Nevada and extending into the borders of California in Inyo and Mono Counties, according to Coville. This species has not been collected within our limits, but it may be expected along our northern borders in the Mohave Desert. Lower Sonoran.

RANUNCULACEAE. Buttercup Family.

1. CLEMATIS. Clematis.

Ovaries and achenes pubescent.	
Leaflets 5; sepals thin, 7–10 mm. long.	1. *C. ligusticifolia californica.*
Leaflets 3; sepals thick, 12–18 mm. long.	2. *C. lasiantha.*
Ovaries and achenes glabrous.	3. *C. pauciflora.*

1. **Clematis ligusticifolia californica** S. Wats. Bot. Calif. **1**: 3. 1876.

Type locality: "San Diego to the Sacramento and to Arizona."

Distribution: Central California southward to the southern boundary of the State. In southern California it is found along streams in the valleys and foothills. Upper and Lower Sonoran.

Specimens examined: Santa Barbara, *Bingham; Abrams 4157;* San Gabriel Mountains, *McClatchie*, Aug. 1895; Monrovia Canyon, *Dudley*, Nov. 20, 1907; San Antonio Canyon, *Baker 3438;* Los Angeles, *Abrams 4168;* Lytle Creek Canyon, *Abrams 1916;* San Bernardino, *Parish;* Jamul Valley, *Susan G. Stokes*, June 19, 1895; Cajon Pass, *Abrams & McGregor 837.*

2. **Clematis lasiantha** Nutt. in Torr. & Gray, Fl. N. Am. **1**: 9. 1838.

Type locality: "Near the sea-coast of St. Diego."

Distribution: Central California south to the southern boundary of the State. In southern California this is the most common clematis. It is frequent in the chaparral on the coast slope of all the mountains and foothills. Upper Sonoran and extending into the upper parts of the Lower Sonoran of the coastal slope.

Specimens examined: Santa Barbara, *Nuttall; Elmer 3844;* Montecito, *Franceschi*, 1894; Sulphur Mountain, Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 128;* Santa Monica Mountains, *Abrams 1306;* Mount Wilson trail, *Abrams 2610;* Cañon Diablo, *Parish 4709;* Mill Creek, *Parish*, June, 1898.

3. **Clematis pauciflora** Nutt. in Torr. & Gray, Fl. N. Am. **1**: 9. 1838 & **1**: 657. 1840.

Type locality: "Near the sea-coast of St. Diego."

Distribution: Santa Barbara County southward to northern Lower California. In southern California this species is almost wholly restricted to San Diego County, where it is the common clematis. Upper and Lower Sonoran.

Specimens examined: Santa Barbara, *Elmer 3906;* near San Bernardino, *Parish 3626;* Whitewater, *Vasey*, Feb. 1881; San Diego, *Nuttall; Abrams 3428;* Foster, *Chandler 5033;* Point Loma, *Chandler 5088;* Campo, *Abrams 3612;* Hill Valley, between Campo and Jacumba Hot Spring, *Abrams 3736*, San Ysabel, *Henshaw 61.*

BERBERIDACEAE. BARBERRY FAMILY.

1. ODOSTEMON. OREGON GRAPE.

Leaflets 3–7, 15 mm. wide or less, very pale; racemes loosely 5–7-flowered.
  Leaflets 15–25 mm. long; spinose teeth 2–4 on a side, stout. 1. *O. Fremontii.*
  Leaflets oblong-lanceolate, 15–35 mm. long, spinulose-serrate; teeth slender, numerous. 2. *O. Nevinii.*
Leaflets 5–9, 20–30 mm. broad; racemes many-flowered.
  Leaflets green above, scarcely paler beneath, rather thin, spinose teeth 6–10 on a side. 3. *O. fascicularis.*
  Leaflets much paler beneath, prominently reticulate-veined, thick and undulate; spinose teeth usually 4–6 on a side. 4. *O. dictyota.*

1. ODOSTEMON FREMONTII (Torr.) Rydb. Bull. Torr. Bot. Club **33**: 141. 1906.

Berberis Fremontii Torr. Bot. Mex. Bound. 30. 1859.
Mahonia Fremontii Fedde, Engl. Bot. Jahrb. **31**: 98. 1901.

Type locality: "On the tributaries of the Rio Virgen, in southern Utah."

Distribution: Southern Utah and Nevada southward to Arizona, also in southern California and northern Lower California. In southern California this species has only been collected near the southern boundary. Upper Sonoran.

Specimens examined: Walker's ranch, near Jacumba Hot Spring, *Abrams 3693.*

2. **Odostemon Nevinii** (A. Gray).

Berberis Nevinii A. Gray, Syn. Fl. **1**, pt. 1: 69. 1895.
Mahonia Nevinii Fedde, Engel. Bot. Jahrb. **31**: 102. 1901.

Type locality: "Southern California, near Los Angeles on a sandy plain."

Distribution: A rare species apparently confined to the San Fernando Valley, where it occurs sparingly on the sandy slopes along the eastern edge of the valley. Upper Sonoran.

Specimens examined: "Los Angeles Valley," probably San Fernando Valley, *Nevin*, April, 1882; San Fernando, *Franceschi*, 1893; wash near Garnsey, San Fernando Valley, *Grinnell*, Oct. 31, 1903.

3. **Odostemon fascicularis** (DC.).

Mahonia fascicularis DC. Syst. **2**: 19. 1821.

Berberis pinnata Lag. Elench. Hort. Madr. 6. 1803, and 14. 1816, nom. nudum.

Berberis pinnata Don, Bot. Reg. **9**: *pl. 702.* 1823. Not H.B.K. 1821.

Berberis fascicularis Sims, Bot. Mag. **50**: *pl. 2396.* 1823.

Mahonia pinnata Fedde, Engl. Bot. Jahrb. **31**: 86. 1901.

Type locality: "In Americae borealis ora occidentalis circa Monterei et Nutka (Nee ex Lag.)."

Distribution: Foothills of central California from the vicinity of San Francisco to Monterey. The specimens cited below are doubtfully referred to this species, more complete material may prove them distinct.

Specimens examined: Near Glendale, *Hasse;* canyon near San Rafael, *Hasse 3762;* Switzer's trail, San Gabriel Mountains, *Grinnell*, Oct. 8, 1908.

4. **Odostemon dictyota** (Jepson).

Berberis dictyota Jepson, Bull. Torr. Bot. Club **18**: 319. 1891.

Mahonia dictyota Fedde, Engl. Bot. Jahrb. **31**: 89. 1901.

Type locality: "Near the rocky summit of South Peak," Marysville Buttes.

Distribution: The dry interior foothills of central California southward to San Diego County. Growing in chaparral but rare and seldom met with. Upper Sonoran.

Specimens examined: Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 667;* Palomar Mountain, *Susan G. Stokes*, July, 1895; between Julian and Cuiamaca, *Abrams 3964.*

LAURACEAE. Laurel Family.

1. UMBELLULARIA. California laurel or Bay-tree.

1. Umbellularia californica (Hook. & Arn.) Nutt. N. Am. Sylva **1**: 87. 1842.

Tetranthera californica Hook. & Arn. Bot. Beech. 159. 1833.
Oreodaphne californica Nees, Syst. Laurin. 463. 1836.

Type locality: California, probably in the vicinity of San Francisco or Monterey.

Distribution: Valley of the Rogue River, Oregon, southward through the Coast Ranges and on the western slope of the Sierra Nevada to the mountains of San Diego County. In southern California the laurel is frequent in canyons or on shaded slopes in the upper part of the chaparral belt and in the lower Transition, but is usually reduced to a small tree or arborescent shrub.

Umbellularia is one of the many genera peculiar to the California Sub-area, and is a good example of the uniqueness of the flora.

Specimens examined: Mission Canyon, Santa Barbara, *Abrams*, March 6, 1909; Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 817;* Switzer's Camp, San Gabriel Mountains, *Grinnell*, Oct. 8, 1908; Falls Canyon, San Gabriel Mountains, *Dudley*, Dec. 26, 1907; Little Santa Anita Canyon, *Abrams*, July, 1906; Nobles ranch, between Pine Valley and Laguna, San Diego County, *Mearns 3958.*

PAPAVERACEAE. Poppy Family.

Flowers yellow; leaves more or less serrulate; stigmas 2. 1. *Dendromecon.*
Flowers white and very showy; leaves divided; stigmas several. 2. *Romneya.*

1. DENDROMECON. Bush poppy.

1. Dendromecon rigidum Benth. Trans. Hort. Soc. II. **1**: 407. 1834.

Dendromecon fastigiata Greene, Pittonia **5**: 298. 1905.
Dendromecon agnina Greene, Pittonia **5**: 299. 1905.
Dendromecon saligna Greene (?), Pittonia **5**: 300. 1905.
Dendromecon elliptica Greene, Pittonia **5**: 300. 1905.
Dendromecon caesia Greene, Pittonia **5**: 303. 1905.

Type locality: California.

Distribution: Coast Ranges or central California and the western slope of the Sierra Nevada, southward through the chaparral belt to northern Lower California. The species proposed by Greene do not seem valid, at least so far as the plants of the mainland are concerned. I have examined critically all the species enumerated above except *D. saligna* with the result that I feel constrained to reduce them to synonymy. There is variation in foliage, but this is often marked in a locality where the character of the soil or moisture vary, and seems to be an ecological variation.

Specimens examined: Santa Ynez Mountains, *Elmer 3875;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 138;* Big Tejunga Wash, *Abrams 1373;* near Elizabeth Lake, *Abrams & McGregor 401;* vicinity of San Bernardino, *Parish 4835;* Claremont, *Baker 4150*, Waterman Canyon, San Bernardino Mountains, *Parish 3474;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 675;* Fallbrook, *Jones 3103;* Soledad Canyon, *Greene*, May 18, 1885; Encinitas, *Brandegee*, June, 1887; Jamul Valley, *Palmer 238;* Campo, *Vasey 18;* Jacumba Hot Spring, *Mearns 3351;* Julian, *Susan G. Stokes*, July 26, 1895.

2. ROMNEYA. MATILIJA POPPY.

Sepals glabrous, beaked.	1. *R. Coulteri.*
Sepals hispid, beakless or with an inconspicuous beak.	2. *R. trichocalyx.*

1. ROMNEYA COULTERI Harv. Hook. Lond. Journn. Bot. **4**: 75, *pl. 3.* 1845.

Type locality: "In California boreali."

Distribution: Santa Ana Mountains, southward to northern Lower California. Upper Sonoran.

Specimens examined: Trabuco Canyon, Santa Ana Mountains, *Abrams 1852;* near Corona, *Hall 1280;* Santa Ana Canyon, near Anaheim, *Parish 393;* Temescal, *Parish 4394.* This species and the next are not true shrubs, but the stout stems, which often attain a height of 2 meters, persist for a number of years.

2. ROMNEYA TRICHOCALYX Eastw. Proc. Calif. Acad. III. **1**: 133, *pl. 11, f. 4a, 4c.* 1898.

Type locality: The figures "were drawn from fresh specimens [cultivated] in Golden Gate Park," San Francisco.

Distribution: Santa Barbara County southward to northern Lower California. Upper Sonoran.

Specimens examined: Griffens, *Elmer 3876;* Ten Sycamore Flat, Sespe Creek, *Abrams & McGregor 137;* Haven's ranch, near El Nido, *Abrams 3544.*

BRASSICACEAE. MUSTARD FAMILY.

1. LEPIDIUM. PEPPERGRASS.

1. LEPIDIUM FREMONTII S. Wats. Bot. King. Exped. 30, *pl. 4, f. 3, 4.* 1871.

Type locality: "Gathered by Fremont on the Mohave River in 1844, and now collected on sandy foothills near Humboldt Sink."

Distribution: Nevada and Utah south to Arizona and the Mohave Desert of southern California, where it is common in the juniper belt. Upper and Lower Sonoran.

Specimens examined: Desert slopes of the Tehachapi Mountains, near Willow Springs, *Abrams & McGregor 415;* between Tehachapi and Mohave, *Abrams & McGregor 502;* Randsburg, *Heller 7679a.*

CAPPARIDACEAE. CAPER FAMILY.

1. ISOMERIS. BLADDERPOD.

Capsule strongly inflated.
Capsule attenuate at base. 1. *I. arborea.*
Capsule globose, not attenuate at base. 1*a. I. arborea globosa.*
Capsule scarcely inflated, oblong, attenuate at both ends. 1*b. I. arborea angustata.*

1. ISOMERIS ARBOREA Nutt. Torr. & Gray, Fl. N. Am. **1**: 124. 1838.

Cleome Isomeris Greene, Pittonia **1**: 200. 1888.

Type locality: "St. Diego."

Distribution: Vicinity of Mount Pinos southward, especially on the margins of the deserts, to Lower California. On the coast slope it is common about San Diego and occurs on the bluffs along the sea as far northward as Playa del Rey, near Santa Monica.

Specimens examined: Griffens, Lockwood Valley, *Elmer 3888;* Playa del Rey, *Abrams 2509;* La Jolla, *Chandler 5002;* San Diego, *Dunn*, March 17, 1891; *Susan G. Stokes*, June 4, 1895; *Abrams 3524.*

1*a*. **Iomeris arborea globosa** Coville, Proc. Biol. Soc. Wash. **7**: 73. 1892.

Isomeris globosa Heller, Muhlenbergia **2**: 50. 1905.

Type locality: "On Caliente Creek, a few miles above Caliente, Kern County, California."

Distribution: Upper end of the San Joaquin Valley in the vicinity of Caliente westward to the boundary of San Luis Obispo and Santa Barbara Counties, and also on the Sespe Creek in Ventura County. There is considerable variation of the type form in the vicinity of San Diego, and on the desert slopes the two apparently intergrade.

Specimens examined: Sespe Creek, near Ten Sycamore Flat, *Abrams & McGregor 177;* vicinity of Fort Tejon, *Abrams & Mc Gregor 289.*

1*b*. **Isomeris arborea angustata** Parish, Muhlenbergia **3**: 128. 1907.

Type locality: "About Palm Springs and Whitewater."

Distribution: Mohave and Colorado Deserts also on Cedros Island (*Anthony 7*). Lower Sonoran.

Specimens examined: Desert slope of Tehachapi Pass, *Abrams & McGregor 504.*

HYDRANGEACEAE. Hydrangea Family.

1. PHILADELPHUS. Syringa.

1. **Philadelphus pumilus** Rydb. N. Am. Fl. **22**: 173. 1905.

Type locality: "In rocky places, San Jacinto Mountains, southern California, at an altitude of 2500 meters."

Distribution: According to Hall this wild syringa is very common among rocks in the upper parts of the Transition from Lake Surprise to the head of Round Valley, San Jacinto Mountains, and "is most plentiful on ridges overlooking the Colorado Desert at 8000–9000 ft. alt., where the low bushes, covered with profusion of white flowers, are very conspicuous on the rocky walls in August."

Specimens examined: Vicinity of Tamarack Valley, San Jacinto Mountains, *Hall 2500.*

GROSSULARIACEAE. Gooseberry Family.

Pedicels jointed beneath the ovary; nodal spines none or when present hypanthium not apparent. 1. *Ribes.*

Pedicels not jointed; nodal spines present; hypanthium evident. 2. *Grossularia.*

1. RIBES. Currant.

Stems armed with spines and bristles; hypanthium saucer-shaped. 1. *R. montigenum.*

Stems without spines or bristles.
  Calyx smooth, yellow; leaves involute in bud. 2. *R. gracillimum.*
  Calyx pubescent, not yellow; leaves plicate in bud.
    Leaves evergreen; holly-like. 3. *R. viburnifolium.*
    Leaves deciduous, not holly-like.
      Bracts herbaceous, toothed; flowers greenish or pinkish white. 4. *R. cereum.*
      Bracts scarious, entire or ciliate.
        Style glabrous; ovary with only gland-tipped hairs. 5. *R. nevadense.*
        Style villous below; ovary canescent.
          Flowers pink or purple, 8–10 mm. long. 6. *R. malvaceum.*
          Flowers white or greenish-white, 5–7 mm. long. 7. *R. indecorum.*

1. Ribes montigenum McClatchie, Erythea **5**: 38. 1897.

Ribes lacustre molle A. Gray, Bot. Calif. **1**: 206. 1876.

Ribes nubigenum McClatchie, Erythea **2**: 80. 1894. Not Philippi, 1857.

Ribes lacustre lentum M. E. Jones, Proc. Calif. Acad. II. **5**: 681. 1895.

Ribes molle Howell, Fl. NW. Am. **1**: 209. 1898. Not Poepp. 1858.

Ribes lentum Coville & Rose, Proc. Biol. Soc. Wash. **15**: 28. 1902.

Type locality: "Summit of Mt. San Antonio, 10,000 ft. altitude, among dry exposed rocks."

Distribution: High mountains of the arid regions from eastern Washington and Montana southward to southern California and New Mexico. Canadian Zone.

Specimens examined: Mount Pinos, *Elmer 4010;* Mount San Antonio, *McClatchie*, Aug. 16, 1893; Mount San Gorgonio, near the summit, *Abrams & McGregor 746.*

2. Ribes gracillimum Coville & Britton, N. Am. Fl. **22**: 205. 1908.

Type locality: "Stanford University, California."

Distribution: Foothills of the Coast Ranges and the Sierra Nevada of central California southward to southern California. This species has been referred to *R. aureum* or *R. tenuiflorum* in the California manuals. Upper Sonoran.

Specimens examined: Eaton's Wash, near Sierra Madre, *Abrams 1491;* Glendora, *Baker 4154.*

3. Ribes viburnifolium A. Gray, Proc. Am. Acad. **17**: 202. 1882.

Type locality: "Northern part of Lower California near All Saints Bay."

Distribution: Islands off the coast of southern California, and on the mainland from the vicinity of Del Mar, San Diego County southward to All Saints Bay, Lower California. Upper and Lower Sonoran.

Specimens examined: Santa Catalina Island, *Miss Merritt,* April, 1894; *Brandegee,* May 12, 1894.

4. Ribes cereum Dougl. Trans. Hort. Soc. **7**: 512. 1830.

Cerophyllum Douglasii Spach, Hist. Veg. **6**: 153. 1838.

Ribes balsamiferum Kell. Proc. Calif. Acad. **2**: 94. 1861.

Type locality: "On the dry exposed granite rocks or schist, throughout the chain of the river Columbia from Great Falls, 45° 46′ 17″ N. Lat. to the source of that stream in the Rocky Mountains, 52° 07′ 09″."

Distribution: Southern British Columbia southward through the Rocky Mountains and along the Pacific Coast to the higher mountains of southern California. Canadian Zone.

Specimens examined: Mount Pinos, *Elmer 3987; Abrams & McGregor 235;* North Baldy, San Gabriel Mountains, *Abrams & McGregor 619;* near the summit of Mount San Antonio, *Leiberg 3354; Abrams 1937, 2707;* Huston Flat, San Bernardino Mountains, *Shaw & Illingsworth 106;* Tahquitz Valley, San Jacinto Mountains, *Hall 2350;* San Jacinto Mountains, *Hasse,* July 2, 1892.

5. Ribes nevadense Kell. Proc. Calif. Acad. **1**: 63. 1855.

Ribes Grantii Heller, Muhlenbergia **4**: 27. 1908.

Type locality: No locality given with the original description, but according to the label on a drawing of this species by Dr. Kellogg it was "from a specimen furnished by Mr. Garvett of Placerville."

Distribution: Southern Cascade Mountains southward through the Transition Zone of the Sierra Nevada to the mountains of southern California. Growing in moist places and along streams.

Specimens examined: Mount Pinos, *Abrams & McGregor 257;* Mount Wilson, *Abrams 2583; Grant,* May 17, 1904; Swartout Valley, San Gabriel Mountains, *Abrams & McGregor 651;* Bear Valley, *Parish 3107;* Huston's Flat, San Bernardino Mountains, *Shaw & Illingsworth 106.*

6. RIBES MALVACEUM Smith, in Rees Cycl. **30**, no. 13. 1815.

Ribes malvaceum viridifolium Abrams, Bull. S. Calif. Acad. **1**: 67. 1902.

Ribes viridifolium Heller, Muhlenbergia **1**: 77. 1904.

Ribes purpurascens Heller, Muhlenbergia **4**: 29. 1908.

Type locality: "Gathered in California by Mr. Menzies."

Distribution: Foothills of the Coast Ranges of central California southward to Lower California. The specimens south of Santa Barbara vary considerably from the typical form and were described (*R. malvaceum viridifolium*) as a variety, a disposition that may prove more logical than the present one which I have adopted from Coville & Britton. Upper Sonoran.

Specimens examined: Mission Canyon, near Santa Barbara, *Abrams,* March 6, 1909; Santa Monica Mountains, *Brewer 69; Abrams 1313;* Cahuenga Pass, *Brewer 183;* Mount Wilson, on the Pasadena trail, altitude 1100 meters, *Abrams 1525;* Santa Anita Canyon, San Gabriel Mountains, *Grinnell 103;* City Creek, San Bernardino Mountains, *Parish,* April 14, 1906.

7. RIBES INDECORUM Eastwood, Proc. Calif. Acad. III. **2**: 243. 1902.

Ribes malvaceum indecorum Jancz. Mem. Soc. Geneve **35**: 325. 1907.

Type locality: "At Cajon Heights, near San Diego, California."

Distribution: In the chaparral belt of the mountains of Ventura County southward to the international boundary, and probably extending into adjacent Lower California. Upper Sonoran.

Specimens examined: Sulphur Mountain, near Santa Paula, *Abrams & McGregor 35;* San Fernando Valley, *Brewer 200;* Arroyo Seco Canyon, San Gabriel Mountains, *Grinnell 18; Grant 793;* Claremont, *Baker 5238;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 673;* Whitewater, *Vasey*, 1881; Toro Mountains, altitude 1300 meters, *Leiberg 3166;* San Ysabel, *Henshaw 212;* Fallbrook, *Jones 3102;* Oriflamme Canyon, Cuiamaca Mountains, *Abrams 3936;* Cajon Heights, *Eastwood*, March 14, 1891; Potrero, *Abrams 3551;* Ramona, *Brandegee*, March, 1906.

2. GROSSULARIA. Gooseberry.

Flowers 5-merous.
    Berry armed with prickles.
        Herbage glandular-pubescent; prickles gland-tipped. 1. *G. amara.*
        Herbage not glandular-pubescent; prickles stiff, not gland-tipped.
            Leaves shiny, minutely and sparsely pubescent; calyx-lobes twice the length of the tube. 2. *G. hesperia.*
            Leaves canescent; calyx-lobes equaling the tube. 3. *G. Roezli.*
    Berry without prickles, glabrous or pubescent.
        Styles glabrous; flowers yellow.
            Herbage glandular-pubescent; berries yellow. 4. *G. velutina.*
            Herbage puberulent, not glandular; berries red. 5. *G. quercetorum.*
        Styles pubescent below; flowers purple. 6. *G. Parishii.*
Flowers 4-merous, bright red and showy. 7. *G. speciosa.*

1. Grossularia amara (McClatchie) Coville & Britton, N. Am. Fl. **22**: 216. 1908.

Ribes amarum McClatchie, Erythea **2**: 79. 1894.

Type locality: "Shaded canyons of the San Gabriel Mountains."

Distribution: On shaded canyon slopes in the chaparral belt from the southern Sierra Nevada southward through the mountains of southern California to the San Bernardino Mountains. Upper Sonoran.

Specimens examined: Near Santa Barbara, *Elmer 3753; Abrams*, March 6, 1909; San Gabriel Mountains, near Pasadena, *McClatchie*, March, 1896; Millards Canyon, San Gabriel Mountains, *Abrams*, March, 1899; Mount Wilson trail, altitude 700 meters, *Abrams 1508;* Cañon Diablo, San Bernardino Mountains, *Parish*, July, 1901; San Antonio Canyon, San Gabriel Mountains, *Baker 4064*.

2. GROSSULARIA HESPERIA (McClatchie) Coville & Britton, N. Am. Fl. **22**: 215. 1908.

Ribes hesperium McClatchie, Erythea **2**: 79. 1894.
Ribes occidentale hesperium Jancz. Mem. Soc. Geneve **35**: 68. 1907.

Type locality: "Common in shaded canyons of the San Gabriel Mountains."

Distribution: In the chaparral belt from the mountains of Ventura County southward to the San Gabriel Mountains.

Specimens examined: Sulphur Mountains Spring, near Santa Paula, *Abrams & McGregor 8;* Santa Monica Mountains, *Brewer 72;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 250, 319, 2562;* Santa Monica Canyon, *Abrams 1477;* San Gabriel Mountains near Pasadena, *McClatchie*, Jan., 1894; Cahuenga Pass, *Brewer 184;* Eaton's Canyon, San Gabriel Mountains, *Braunton 751;* Santa Anita Canyon, *Grinnell 101.*

3. GROSSULARIA ROEZLI Regel, Gartenflora **28**: 226. 1879.

Ribes amictum Greene, Pittonia **1**: 69. 1887.
Ribes aridum Greene, Pittonia **4**: 35. 1889.
Ribes Wilsonianum Greene, Erythea **3**: 70. 1895.

Type locality: Western North America.

Distribution: Southern Sierra Nevada southward through the mountains of southern California. This species occurs most abundantly in the arid parts of the Transition Zone and in the higher altitudes of the Upper Sonoran in the interior foothills.

Specimens examined: Water Canyon, Tehachapi Mountains, *Abrams & McGregor 481;* Fort Tejon, *Abrams & McGregor 296;* Mount Pinos, *Elmer 3811;* summit of Hines Peak, Topatopa Mountains, *Abrams & McGregor 79;* Mount Gleason, *Elmer 4249;* North Baldy, San Gabriel Mountains, *Abrams & McGregor 606;* Mount San Antonio, *Abrams 2713; Leiberg 3357;* Mount Santiago, Santa Ana Mountains, *Abrams 1833;* Middle Peak, Cuiamaca Mountains, *Abrams 3860;* Palomar Mountain, *Parish 4404.*

4. GROSSULARIA VELUTINA (Greene) Coville & Britton, N. Am. Fl. **22**: 220. 1908.

Ribes leptanthum brachyanthum A. Gray, Bot. Calif. **1**: 205.8176.
Ribes velutinum Greene, Bull. Calif. Acad. **1**: 83. 1885.

Ribes brachyanthum Card, Bush Fruits 460. 1898.
Ribes glanduliferum Heller, Muhlenbergia **2**: 56. 1905.
Ribes Stanfordii Elmer, Bot. Gaz. **41**: 315. 1906.

Type locality: "Open grounds in the northern part of California and the region adjacent."

Distribution: Eastern Oregon and Utah southward to northern Arizona and southern California. Transition.

Specimens examined: Mount Pinos, *Elmer 3958*.

5. GROSSULARIA QUERCETORUM (Greene) Coville & Britton, N. Am. Fl. **22**: 220. 1908.

Ribes quercetorum Greene, Bull. Calif. Acad. **1**: 83. 1885.
Ribes Congdoni Heller, Muhlenbergia **1**: 101. 1904.
Ribes leptanthum quercetorum Jancz. Mem. Soc. Geneve **35**: 381. 1907.

Type locality: "El Paso de Robles [California]."

Distribution: Southern Monterey County and Mariposa County southward to the Liebre Mountains in Los Angeles County. In southern California this species is confined to the vicinity of Fort Tejon, extending southward on the hills bordering the western part of Antelope Valley to Oakgrove Canyon, Liebre Mountains. Upper Sonoran.

Specimens examined: Fort Tejon, *Abrams & McGregor 294;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 319*.

6. GROSSULARIA PARISHII (Heller) Coville & Britton, N. Am. Fl. **22**: 224. 1908.

Ribes Parishii Heller, Muhlenbergia **1**: 134. 1906.

Type locality: "San Bernardino Valley, San Bernardino County, California, altitude 1000 feet."

Distribution: The two stations given below are the only localities where this species has been noted. It is related to *G. divaricatum* which has been reported from Santa Barbara County, but that is less pubescent and has the stamens exceeding instead of equaling the calyx-lobes. Upper Sonoran.

Specimens examined: Oak Knoll, near Pasadena, McClatchie, Feb. 10, 1894; near San Bernardino, *Vasey*, 1881; *Parish 6001;* and April 14, 1906.

7. **Grossularia speciosa** (Pursh) Coville & Britton, N. Am. Fl. **22**: 212. 1908.

Ribes speciosum Pursh, Fl. Am. Sept. 731. 1814.
Robsonia speciosa Spach, Hist. Veg. **6**: 181. 1838.

Type locality: "On the north-west coast." First collected by Menzies, probably at Monterey.

Distribution: Foothills of the Coast Ranges from Monterey County south to San Diego. In southern California this species is chiefly confined to the Coastal Sub-district. Upper Sonoran.

Specimens examined: Mission Canyon, Santa Barbara, *Abrams*, March 6, 1909; Sepulveda Canyon, Santa Monica Mountains, *Abrams 2563, 3118;* Sherman, *Braunton 362;* Eagle Rock Canyon, near Pasadena, *Braunton 180;* Twin Oaks, *Bailey 306;* Oceanside, *Parish 4456;* San Diego, *Dunn*, March 21, 1891.

PLATANACEAE. PLANE-TREE FAMILY.

1. PLATANUS. SYCAMORE OR PLANE-TREE.

1. **Platanus racemosa** Nutt. N. Am. Sylva **1**: 47. 1842.

Platanus californica Benth. Bot. Sulph. 54. 1844.

Type locality: "A native of Upper California, in the vicinity of Sta. Barbara."

Distribution: From the lower Sacramento Valley and the inner Coast Ranges southward to northern Lower California. In southern California this species is common along streams and on canyon floors in the mountains to altitudes of 600 meters, or occasionally, on the desert slopes, extending to 1200 meters. Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 3831;* Sulphur Mountain Spring, near Santa Paula, *Abrams & McGregor 61;* Ten Sycamore Flat, Sespe Creek, *Abrams & McGregor 165;* Rock Creek, desert slopes of the San Gabriel Mountains, *Abrams & McGregor 529;* Santa Monica Mountains, *Abrams 1253;* between Los Angeles and Pasadena, *Abrams*, March, 1899; San Gabriel, *Cox*, March 28, 1908; Alpine, *Mearns 4035;* Sweetwater Valley, *Susan G. Stokes*, July, 1895.

CROSSOSOMATACEAE. CROSSOMA FAMILY.

1. CROSSOSOMA.

Petals broadly obovate or orbicular-obovate; follicles many-seeded. 1. *C. californicum.*
Petals spatulate to oblong; follicles few-seeded. 2. *C. Bigelovii.*

1. Crossosoma californicum Nutt. Jour. Acad. Phila. II. **1**: 50. 1848.

Type locality: Santa Catalina Island.

Distribution: This insular species has been found on Santa Catalina, San Clemente, and Guadalupe Islands, but not on the mainland. It is included for comparison and on account of its botanical interest.

2. Crossosoma Bigelovii S. Wats. Proc. Am. Acad. **11**: 122. 1876.

Type locality: "In canyons near the south of Bill Williams River, W. Arizona."

Distribution: Northwestern Arizona and adjacent California southward to Lower California. Lower Sonoran.

Specimens examined: White-water *S. B. & W. F. Parish 10;* no locality, *Parry & Lemmon 4;* Palm Springs, *Parish 4105.*

ROSACEAE. Rose Family.

Carpels becoming drupelets in fruit.
Receptacle conical; stems prickly. 3. *Rubus.*
Receptacle flat; stems not prickly. 4. *Rubacer.*
Carpels becoming dry achenes or 2-seeded follicles.
Hypanthium not fleshy.
Styles elongated and plumose in fruit.
Calyx 5-parted; leaves alternate.
Petals present; flowers showy, terminal on short or elongated peduncles; leaves small, lobed.
Sepals with alternate linear bractlets. 5. *Fallugia.*
Sepals without bractlets. 6. *Cowania.*
Petals none; flowers small, axillary; leaves toothed or entire. 7. *Cerocarpus.*
Calyx 4-parted; leaves opposite. 9. *Coleogyne.*
Styles not becoming long and plumose in fruit; petals present.
Leaves opposite. 1. *Lyonothamnus.*
Leaves alternate.
Flowers paniculate or racemose; leaves simple.
Leaves plain, toothed above the middle. 2. *Sericotheca.*
Leaves terete, rarely obscurely toothed. 8. *Adenostoma.*
Flowers corymbose or solitary.
Leaves 1–5-cleft; flowers solitary. 10. *Kunzia.*

Leaves 3-pinnate; flowers corymbose.
11. *Chamaebatia.*

Hypanthium fleshy, becoming bright-colored and pome-like in fruit.
12. *Rosa.*

1. LYONOTHAMNUS.

1. Lyonothamnus floribundus A. Gray, Proc. Am. Acad. **20**: 292. 1885.

Lyonothamnus asplenifolius Greene, Bull. Calif. Acad. **1**: 187. 1885.

Type locality: "Santa Catalina Island."

Distribution: This monotypic genus is restricted to the islands off the coast of southern California, where it has been found on Santa Cruz, Santa Catalina, and San Clemente. Although this species has not been found on the mainland it is included on account of its botanical and horticultural interest.

2. SERICOTHECA.

Inflorescence ample, well-compound; leaves 3–6 cm. long. 1. *S. franciscana.*

Inflorescence small and narrow, simple, racemose, or with a few short branches; leaves 1–1.5 cm. long. 2. *S. concolor.*

1. Sericotheca franciscana Rydb. N. Am. Fl. **22**: 262. 1908.

Type locality: "San Leandro, California."

Distribution: Coast Ranges of central California southward to the vicinity of Los Angeles. Humid Transition and Upper Sonoran.

Specimens examined: Griffith Park, near Los Angeles, *Braunton 462.*

2. Sericotheca concolor Rydb. N. Am. Fl. **22**: 264. 1908.

Spiraea discolor dumosa S. Wats. Bot. Calif. **1**: 170. 1876, in part.

Holodiscus discolor dumosa S. Wats.; Abrams, Fl. Los Angeles 196. 1904.

Type locality: "Mt. Davidson, Nevada."

Distribution: Western Nevada and adjacent California, southward through the higher mountains of southern California. Canadian Zone.

Specimens: Mount Pinos, on the summit, *Abrams & McGregor 234;* Mount San Antonio, near the summit, *Abrams 1917;* Green Valley, San Bernardino Mountains, *Hall 1311;* near the summit of Mount San Gorgonio, *Abrams & McGregor 756;* Tahquitz Valley, San Jacinto Mountains, *Hall 2465.*

3. RUBUS. Bramble.

Drupelets separating from the receptacle in fruit.	1. *Rubus leucodermis.*
Drupelets persistent on the receptacle.	2. *Rubus vitifolius.*

1. Rubus leucodermis Dougl.; Hook. Fl. Bor. Am. **1**: 178. 1833.

Type locality: "North-West Coast America."

Distribution: British Columbia south to Wyoming and the mountains of southern California. Transition.

Specimens examined: Mount Wilson, *Abrams 2584;* North Baldy, San Gabriel Mountains, *Abrams & McGregor 617;* Mill Creek Falls, *Parish 5046.*

2. Rubus vitifolius Cham. & Sch. Linnaea **2**: 10. 1827.

Type locality: "Ad San Francisco Californiae reperimus."

Distribution: Coast Ranges of central California south to the southern boundary of the State. Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 3781;* Sulphur Mountain, *Abrams & McGregor 22;* Pasadena, *Jones*, 1882; Santa Monica Mountains, *Abrams 1309;* Palomar Mountain, altitude 1500 meters, *Susan G. Stokes*, July 21, 1895; San Diego, *Parry*, 1850.

4. RUBACER. Thimble berry.

1. Rubacer velutinum (Hook. & Arn.) Heller, Muhlenbergia **1**: 106. 1904.

Rubus velutinus Hook. & Arn. Bot. Beech. 140. 1832.
Rubus Nutkanus velutinus Brewer, Bot. Calif. **1**: 172. 1876.

Type locality: "A native of San Francisco," California.

Distribution: Coast Ranges and the Sierra Nevada south to San Pedro Martir Mountain, Lower California. Transition and Upper Sonoran.

Specimens examined: Fremont's Pass, Santa Ynez Mountains, *Mrs. M. Marshall*, July, 1907; Job's Peak, San Bernardino Mountains, *Parish 2367;* Palomar (Smith) Mountain, *Susan G. Stokes*, July 28, 1895.

5. FALLUGIA.

1. Fallugia paradoxa (Don) Endl.; Torr. Emory, Notes Mil. Reconnois. 140. 1848.

Sieversia paradoxa Don, Trans. Linn. Soc. **14**: 576, *pl. 22, figs. 7–10.* 1825.

Type locality: "In Mexico."

Distribution: Providence Mountains, southeastern California, eastward through southern Utah to western Texas, and south through northern Mexico. Lower Sonoran.

Specimens examined: Providence Mountains, *Cooper*.

6. COWANIA.

1. Cowania Stansburiana Torr. Stansb. Exped. 386. *pl. 3.* 1852.

Type locality: "Stansbury's Island, Salt Lake."

Distribution: Utah and Nevada southward through Arizona and New Mexico. Lower Sonoran. *C. mexicana* Don, of central Mexico, has a shorter, almost campanulate calyx-tube.

Specimens examined: This has been collected by Brandegee in the Providence Mountains, but I have not seen his specimens.

Cowania mexicana dubia Brandegee (Zoe **5**: 149. 1903) I have not seen. Its flowers are smaller than those of *C. Stansburiana* and the styles are densely covered with short bristle-like hairs instead of plumose.

7. CERCOCARPUS. Mountain mahogany.

Leaves narrowly lanceolate; margins entire, revolute. 1. *C. ledifolius.*
Leaves obovate to rounded, margins toothed above.
  Leaves obovate, pubescent or glabrous beneath.
    Calyx tomentose; its teeth broadly triangular. 2. *C. betulaefolius.*
    Calyx glabrous; its teeth nearly subulate. 3. *C. minutiflorus.*
  Leaves oval to rounded, densely white downy beneath. 4. *C. Traskiae.*

1. Cercocarpus ledifolius Nutt. in Torr. & Gray, Fl. N. Am. **1**: 427. 1838.

Type locality: "Rocky Mountains, in alpine situation on the summits of the hills of Bear River of Timanagos, near the celebrated '*Lear Springs.*'"

Distribution: Southwestern Washington and southern Idaho south to southern California and Arizona. Most frequent in the upper part of the Transition Zone, but sometimes extends to the edges of the Upper Sonoran.

Specimens examined: Mount Pinos, *Elmer 3974;* Mount San Antonio, *Abrams 1919, 2680;* Mill Creek Falls, altitude 1800 meters, *Parish 5066;* North Baldy, San Gabriel Mountains, *Abrams & McGregor 616;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 663.*

2. CERCOCARPUS BETULAEFOLIUS Nutt.; Hook. Ic. Pl. **4**: *pl. 322.* 1841.

Cercocarpus betuloides Nutt.; Torr. & Gray, Fl. N. Am. **1**: 427. 1840.
Cercocarpus parvifolius glaber S. Wats. Bot. Calif. **1**: 175. 1876.
Cercocarpus parvifolius betuloides Sarg. Silva N. Am. **4**: 66. 1892.

Distribution: Coast Ranges of central California southward to the mountains of northern Lower California. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall; Brandegee,* June, 1889; *Elmer 3868;* Mountain Drive, near Santa Barbara, *Abrams 4121;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 3116;* Fort Tejon, *Abrams & McGregor 293;* Topatopa Mountains, *Abrams & McGregor 108;* Oakgrove Canyon, *Abrams & McGregor 325;* Mount Wilson trail, *Abrams 1522;* near Monrovia, *Dudley,* Nov. 18, 1907; Rock Creek, San Gabriel Mountains, *Abrams & McGregor 588;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 674;* Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 707;* Mill Creek Canyon, *Abrams & McGregor 820;* Santa Ana Mountains, near Elsinore, *Abrams,* July 21, 1908; near Campo, *Abrams 3611;* Jacumba Hot Spring, *Mearns 3356.*

3. CERCOCARPUS MINUTIFLORUS Abrams, Bull. Torr. Bot. Club **37**: 149. 1910.

Cercocarpus parvifolius glaber S. Wats. Bot. Calif. **1**: 175. 1876, excluding Nuttall's specimen, which is the type.
Cercocarpus betulaefolius minor Schneider, Handb. Laubholzk. **1**: 531. 1905 (?).

Type locality: "On chaparral covered hills near San Dieguito on road to San Diego."

Distribution: On chaparral covered hills and mesas from the vicinity of Escondido, San Diego County, southward and westward to northern Lower California. Upper and Lower Sonoran.

Specimens examined: San Dieguito (Bernardo), *Abrams 3376.*

4. CERCOCARPUS TRASKIAE Eastwood, Proc. Calif. Acad. III. **1**: 136. 1898.

Type locality: "At the northern part of the island [Santa Catalina] in a volcanic region known as 'Salte Verde.'"

Distribution: This peculiar species has been found only at the type locality. It is included here on account of its botanical interest.

8. ADENOSTOMA. CHAMISE.

Leaves fascicled, channelled on one side.
  Leaves linear-subulate, acute, 6–9 mm. long. 1. *A. fasciculatum.*
  Leaves obtuse, 4–6 mm. long. 2. *A. fasciculatum obtusifolium.*
Leaves not fascicled, narrowly linear, 6–10 mm. long. 3. *A. sparsifolium.*

1. ADENOSTOMA FASCICULATUM Hook. & Arn. Bot. Beech. 139, *pl. 30.* 1832.

Type locality: "In sandy plains in the Bay of Monterey."

Distribution: The chamise is one of the most characteristic shrubs of the California chaparral, being confined to the California Sub-area of the Upper Sonoran. In southern California it is much more abundant on foothills bordering the interior valleys, than on the coastal mountains. Over large tracts on the eastern end of the San Gabriel Mountains and on the lower southern slopes of the San Bernardino Mountains it often forms almost pure thickets.

Specimens examined: Montecito, *Franceschi*, 1894; Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 140;* Mount Wilson, *Grinnell*, June 6, 1903; Little Santa Anita Canyon, *Abrams 2649;* Santa Monica Mountains, *Abrams 1263;* vicinity of San Bernardino, *Parish 4838;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 665;* near Potrero, *Abrams 3727.*

1*a*. ADENOSTOMA FASCICULATUM OBTUSIFOLIUM S. Wats. Bot. Calif. **1**: 184. 1876.

Adenostoma fasciculatum var. β Torr. & Gray, Fl. N. Am. **1**: 430. 1840.

Adenostoma brevifolium Nutt.; Torr. & Gray, Fl. N. Am. **1**: 430. 1840, as a synonym.

Type locality: "San Diego."

Distribution: Chiefly confined to the vicinity of San Diego, and extending from there southward into Lower California, but what seems to be identical occurs on the desert slopes of the Liebre Mountains. Upper and Lower Sonoran.

Specimens examined: "Upper California," *Nuttall;* San Diego, *Emory*, 1846; *Thurber 564; Palmer 79;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 387*.

2. Adenostoma sparsifolium Torr. in Emory's Notes Mil. Reconnois. 140. 1848.

Type locality: "Cordilleras of California." Vicinity of Warner's ranch, San Diego County, where it was collected by Emory, Dec. 2, 1846.

Distribution: San Jacinto Mountains southward to Lower California. Upper Sonoran.

Specimens examined: Vicinity of Warner's ranch, *Emory*, Dec. 2, 1846; mountains east of San Diego, *Parry*, July, 1850; near Pine Valley, *Orcutt*, August 31, 1883; *Mearns 3982;* exposed south slopes in the vicinity of Chalk Hill, altitude 1440 meters, San Jacinto Mountains, *Hall 2638;* San Felipe, altitude 900 meters, *Susan G. Stokes*, July 25, 1895.

9. COLEOGYNE.

1. Coleogyne ramosissima Torr. Pl. Frem. 8, *pl. 4*. 1853.

Type locality: "Sources of the Mohave and Virgin Rivers, tributaries of the Colorado of the West, in the mountains of southern California."

Distribution: Almost throughout the Mohave Desert, eastward to southern Nevada and Arizona. Higher altitudes of the Lower Sonoran, and extending into the Upper Sonoran.

Specimens examined: Ironwood Spring, Colorado Desert, *Brandegee*, April 7, 1901.

10. KUNZIA.

1. Kunzia glandulosa (Curran) Greene, Pittonia **2**: 299. 1892.

Purshia glandulosa Curran, Bull. Calif. Acad. **1**: 153. 1885.

Type locality: "On the Mohave side of Tehachapi Pass."

Distribution: Desert slopes of the mountains bordering the Mojave Desert. Upper Sonoran.

Specimens examined: Rock Creek, *Davidson*, Aug., 1901; *Abrams & McGregor 528;* Gold Mountain, San Bernardino Mountains, altitude 2300 meters, *Abrams 2069;* southeastern slope of Mount Pinos, *Abrams & McGregor 259;* between Tehachapi and

Willow Springs, *Abrams & McGregor 426;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 662.*

11. CHAMAEBATIA.

1. Chamaebatia australis (Brandegee) Abrams, Bull. Torr. Bot. Club **34**: 623. 1907.

Chamaebatia foliolosa australis Brandegee, Bot. Gaz. **27**: 447. 1899.

Type locality: "La Gruella, Lower California," and "Mt. Miguel near San Diego."

Distribution: Mount Miguel, southern San Diego County, southward through the foothills of northern Lower California. Upper Sonoran.

Specimens examined: San Miguel Mountain, *Chandler 5214.*

12. ROSA. Rose.

Foliage more or less glandular-pubescent or puberulent.
  Infrastipular spines present, these and the prickles recurved or reflexed.
    Leaflets canescent beneath with a close short-villous pubescence. 1. *R. Aldersoni.*
    Leaflets scarcely paler beneath, somewhat glandular-pubescent. 2. *R. californica.*
  Infrastipular spines wanting; prickles often numerous, slender and straight. 3. *R. gratissima.*
Foliage glabrous; infrastipular spines wanting; prickles straight. 4. *R. mohavensis.*

1. Rosa Aldersoni Greene, Pittonia **5**: 110. 1903.

Type locality: "Witch Creek, San Diego Co., California."

Distribution: This species is closely related to *R. californica* and may be merely a canescent form of it, but it seems to occupy a more or less distinct geographic area. The plants I have referred to this species grow in the higher parts of the chaparral and in the Transition Zone of the San Bernardino and the Cuiamaca Mountains.

Specimens examined: West Fork of Deep Creek, San BernardinoMountains, *Abrams & McGregor 714;* Strawberry Peak, San Bernardino Mountains, *Abrams 2054;* Witch Creek, Cuiamaca Mountains, *Alderson*, June, 1894; Pine Valley, *Mearns 3984.*

2. Rosa californica Cham. & Sch. Linnaea **2**: 35. 1827.

Type locality: "San Francisco."

Distribution: In the Coast Ranges and the interior of central California, southward to San Diego and perhaps northern Lower California. In southern California it is the only rose in the valleys and lower foothills of the coastal slope. There is considerable variation in the shape of the leaves and in their serrations. In most of the material examined the hypanthium is globose and glabrous in the flowering stage. Specimens from Oakgrove Canyon, Liebre Mountains, however, have an obovate hypanthium, and others from Red Reef Canyon, Topatopa Mountains, are pubescent on the hypanthium and sepals. Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 4195;* Fort Tejon, *Abrams & McGregor 292;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 135;* between Oakgrove Canyon and Elizabeth Lake, *Abrams & McGregor 407;* Santa Monica Canyon, *Abrams 1451;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2539;* San Gabriel, *Bigelow*, March, 1853; vicinity of San Bernardino, *Parish 4191;* Lakeside, *Abrams 3763;* near San Diego, *Susan G. Stokes*, June 15, 1895.

3. Rosa gratissima Greene, Fl. Fran. 73. 1891.

Type locality: "Borders of wet meadows, and about springy places in the mountains of Kern Co."

Distribution: The Tehachapi Mountains southward along the desert slopes to the San Bernardino Mountains. This species is chiefly confined to the desert slopes of the Transition Zone bordering the piñon belt.

Specimens examined: Water Canyon, Tehachapi Mountains, *Abrams & McGregor 482;* Mount Pinos, *Elmer 3732;* Rock Creek, desert slope of the San Gabriel Mountains, altitude 1800 meters, *Abrams & McGregor 586;* Swartout Canyon, San Gabriel Mountains, *Abrams & McGregor 652;* Bear Valley, San Bernardino Mountains, *Abrams 2821.*

4. Rosa mohavensis Parish, Bull. S. Calif. Acad. **1**: 87, *pl. 7.* 1902.

Rosa californica glabrata Parish, Erythea **6**: 88. 1898.

Type locality: "On the desert side of the San Bernardino Mountains, near water, Cushenberry Springs, altitude 400 feet."

Distribution: Mr. Parish reports this species from the desert slope of Mount San Antonio and Rock Creek. It is closely related to *R. gratissima*, of which it may prove to be merely a glabrate form. Upper Sonoran.

Specimens examined: Cushenberry Springs, *Parish 4981.*

MALACEAE. Apple Family.

Carpels 2, free and separating.	1. *Heteromeles.*
Carpels 5, united and coalescent with the fleshy hypanthium.	2. *Amelanchier.*

1. HETEROMELES. Christmas berry or Tollon.

1. **Heteromeles salicifolia** (Presl.).

Photinia salicifolia Presl. Epimel. Bot. 204. 1849.
Crataegus arbutifolia Ait. Hort. Kew. **3**: 202. 1811. Not Lam. 1783.
Photinia arbutifolia Lindl. Trans. Linn. Soc. **13**: 103. 1821.
Heteromeles arbutifolia Roem. Syn. Monog. **3**: 105. 1847.
Heteromeles Fremontiana Dec. Nouv. Ann. Mus. Par. **10**: 144. 1874.

Type locality: "Habitat in California ad Monte-rey et ad portum S. Blas Mexico occidentalis."

Distribution: The tollon or christmas berry is characteristic of the California Sub-area. It extends from Mendocino County through the coast ranges and the western slope of the Sierra Nevada to northern Lower California. It also occurs on the islands off the coast of northern California, and on Cedros Island. Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 3857;* Elizabeth Lake, *Abrams & McGregor 413;* Little Santa Anita Canyon, San Gabriel Mountains, *Abrams 2648;* San Gabriel Canyon, *Abrams* Aug. 10, 1900; Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 676;* Pine Valley, San Diego County, *Mearns 3975;* Jamul Valley, *Susan G. Stokes*, June 19, 1895.

2. AMELANCHIER. Service berry.

Sepals erect; leaves cuspidate, entire or inconspicuously serrate at apex.	1. *A. pallida.*
Sepals strongly reflexed; leaves not cuspidate, distinctly serrate above.	
Hypanthium and sepals tomentose without.	2. *A. venulosa.*
Hypanthium and sepals glabrous without.	3. *A. recurvata.*

1. **Amelanchier pallida** Greene, Fl. Fran. 53. 1891.

Type locality: "Common or dry hills of the northern and northeastern parts of the State [California]."

Distribution: I have seen no authentic specimens of this species, but the specimens here referred to it answer the description. The distribution, as originally given, is therefore greatly extended. Transition.

Specimens examined: Water Canyon, Tehachapi Mountains, *Abrams & McGregor 490;* Cuiamaca Lake, Cuiamaca Mountains, *Abrams 3912.*

2. **Amelanchier venulosa** Greene, Pittonia **4**: 21. 1899.

Type locality: "Cushenberry Springs, in Southern California."

Distribution: Apparently confined to the piñon belt and the Transition Zone of the San Gabriel and the San Bernardino Mountains. The specimens from Dry Lake are not typical, and possibly are nearer the Sierra Nevada plant which has recently been named *A. siskiyouensis.*

Specimens examined: Swartout Canyon, San Gabriel Mountains, *Abrams & McGregor 633;* Fawnskin Park, San Bernardino Mountains, *Parish 4992;* Hathaway Flat, San Bernardino Mountains, *Abrams & McGregor 808;* Dry Lake Canyon, San Bernardino Mountains, *Abrams & McGregor 783.*

3. **Amelanchier recurvata** Abrams, Bull. Torr. Bot. Club **37**: 151. 1910.

Type locality: "In moist places in the Topatopa Mountains, altitude 5500 feet, *Abrams & McGregor 107.*"

Distribution: Only known from the Topatopa Mountains, but probably occurs elsewhere in the Transition Zone in the mountains of Ventura and Santa Barbara Counties.

AMYGDALACEAE. Peach Family.

Ovary and fruit glabrous.	
Leaves deciduous.	
Flowers corymbose or umbellate.	1. *Cerasus.*
Flowers racemose.	2. *Padus.*
Leaves evergreen.	3. *Laurocerasus.*
Ovary and fruit velvety-pubescent.	4. *Amygdalus.*

1. CERASUS. Cherry.

1. **Cerasus arida** Greene, Proc. Biol. Soc. Wash. **18**: 57. 1905.

Type locality: "Borders of the desert at eastern base of the San Bernardino Mountains."

Distribution: The cherry referred to this species occurs sparingly in the Transition Zone of the San Gabriel, San Bernardino and Cuiamaca Mountains. Considerable variation occurs in the specimens examined, and it is evident that a great deal of field study must be given to the western cherries before they are understood. The specimens from Strawberry Peak have narrow, oblanceolate, acutish leaves, which are pubescent and somewhat glandular on the lower surface. They also differ in their prominent approximate veins.

Specimens examined: Lytle Creek Canyon, altitude 1725 meters, *Hall 1471;* near Strawberry Peak, San Bernardino Mountains, *Abrams & McGregor 727;* South Peak, Cuiamaca Mountains, *Abrams 3943;* Green Valley, San Bernardino Mountains, *Abrams & McGregor 734;* San Jacinto Mountains, *Hasse 5680, 1263;* San Bernardino Mountains, altitude 2180 meters, *Parish 3329.*

2. PADUS. Choke cherry.

1. **Padus demissa** (Nutt.) Roem. Syn. Rosifl. 87. 1847.

Cerasus demissa Nutt. in Torr. & Gray, Fl. N. Am. **1**: 411. 1840.
Prunus demissa Walp. Rep. **2**: 10. 1843.
Padus virginiana demissa Schneider, Handb. Laubholzk. **1**: 642. 1906.

Type locality: "Plains of the Oregon towards the sea, and at the mouth of the Wahlamet."

Distribution: Washington and Idaho to southern California. In southern California there is considerable variation in pubescence. The Cuiamaca specimens are glabrous except for pubessence along the mid-vein, thus approaching very closely *P. melanocarpa* of the Rocky Mountains and Great Basin. Upper Sonoran and Transition.

Specimens examined: Mount San Antonio, altitude 2700 meters, *Abrams 2697;* Swartout Canyon, San Gabriel Mountains, *Hall*, June, 1899; *Abrams & McGregor 639;* North Baldy, San Gabriel Mountains, *Abrams & McGregor 620;* Cuiamaca, *Abrams 3828;* "summit of the cordillaries east of San Diego," *Parry*, June, 1850.

3. LAUROCERASUS. Holly-leaved cherry.

1. Laurocerasus ilicifolia (Nutt.) Roem. Syn. Rosifl. 92. 1847.

Cerasus ilicifolia Nutt.; Hook. & Arn. Bot. Beach. Voy. 340. 1832.

Prunus ilicifolia Walp. Rep. **2**: 10. 1843.

Type locality: "St. Barbara, California, *Douglas, Nuttall.*"

Distribution: Coast Ranges from San Francisco Bay south to the southern borders of the State. In the northern part of its range this species often becomes a good sized tree, but in our region it is usually reduced to a shrub. The holly-leafed cherry is common throughout southern California in the foothills and mountains. Upper Sonoran.

Specimens examined: Santa Barbara, *Douglas; Nuttall;* Santa Ynez Mountains, *Elmer 3775;* Cuddy Canyon, near Tejon Pass, *Abrams & McGregor 282;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2551;* Mount Lowe, *Grant 1046;* hills near Verdugo, *Abrams 1380;* Reche Canyon, *Hall 1104;* vicinity of San Bernardino; *Parish*, June, 1897, Potrero, *Abrams 3741;* mountains east of San Diego, *Parry 1850;* Jacumba Hot Spring, *Mearns 3354.*

4. AMYGDALUS. Almond.

Leaves narrowly spatulate, entire; styles very short.	1. *A. fasiculata.*
Leaves ovate or nearly round; denticulate; styles elongated.	2. *A. Fremonti.*

1. Amygdalus fasciculata (Torr.) Greene, Fl. Fran. 49. 1891.

Emplectocladus fasciculatus Torr. Pl. Frem. 10, *pl. 5.* 1850. *Prunus fasciculata* A. Gray, Proc. Am. Acad. **10**: 70. 1874.

Type locality: "Sierra Nevada of California; probably in the southern part of the range."

Distribution: Desert slopes of the San Bernardino Mountains north to the eastern slopes of the southern Sierra Nevada and eastward to southern Utah and Arizona. Canyons and rocky slopes of the juniper belt. Upper and Lower Sonoran.

Specimens examined: Rock Creek, desert slope of the San Gabriel Mountains, *Abrams & McGregor 525;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 668;* Cushenberry Spring, *Abrams 2152;* summit of Providence Mountains, *Cooper*, May 29, 1861.

2. **Amygdalus Fremontii** (S. Wats.).

Prunus Fremontii S. Wats. Bot. Calif. **2**: 442. 1880.

Type locality: "Coast Ranges of southern California; Oriflamme Canyon, San Diego County (*D. Cleveland*); San Bernardino Mountains, *Parry & Lemmon*, n. 108, 1876. Also collected by *Fremont* in 1846, locality uncertain."

Distribution: Southern slopes of the Chuckawalla Mountains, south to northern Lower California. Lower Sonoran and extending into the lower edges of the Upper Sonoran.

Specimens examined: San Felipe, *Parry*, 1850 (Referred to *Prunus subcordata* by Torr. Bot. Mex. Bound. 63); no locality, *Parry & Lemmon 108*.

MIMOSACEAE. MIMOSA FAMILY.

Stamens numerous; pods flattened, straight or more or less curved. 1. *Acacia*.
Stamens 10.
  Pods straight or slightly curved. 2. *Prosopis*.
  Pods coiled into a spiral. 3. *Strombocarpus*.

1. ACACIA. ACACIA.

1. ACACIA GREGGII A. Gray, Pl. Wright. **1**: 65. 1850.

Type locality: "Western Texas" and "dry valley west of Patos, Northern Mexico."

Distribution: A characteristic shrub of the Lower Sonoran, extending from the western borders of the Colorado Desert in southern California eastward to western Texas and southward into Lower California and northern Mexico.

Specimens examined: Banner, *Susan G. Stokes*, July 26, 1895; San Felipe, *Abrams 3970;* Carriso Creek, *Abrams 3985;* Piute Creek, *Norman C. Wilson*, June 6, 1893; near Indio, *Hall 5987;* Jacumba Hot Spring, Cleveland, July 3, 1884; Providence Mountains, *Brandegee*, May 25, 1902.

2. PROSOPIS. MESQUIT.

Leaves glabrous. 1. *P. glandulosa*.
Leaves pubescent. 2. *P. velutina*.

1. PROSOPIS GLANDULOSA Torr. Ann. Lyc. N. Y. **2**: 192. 1828.

Prosopis odorata Torr. & Frem. in Frem. Second Rep. 313, *pl. 1.* 1845, excluding fruit which is *Strombocarpus pubescens*.

Type locality: "On the Canadian? [River]."

Distribution: Deserts of southern California eastward to western Texas, and southward into Lower California and northern Mexico. The *Prosopis juliflora* of the California botanies, but not DC. Lower Sonoran.

Specimens examined: Lancaster, *Elmer 3726;* Cushenberry Springs, *Abrams 2148;* San Bernardino, *Parish 2928; Abrams 2148;* San Jacinto Lake, *Hall 1106;* San Felipe, *Susan G. Stokes*, July 25, 1895; San Diego, *Herre*, July 19, 1902.

2. PROSOPIS VELUTINA Wooten, Bull. Torrey Club **25**: 456. 1898.

Type locality: Several localities were originally cited, but the plants from which the description was drawn were collected by Pringle "in Arizona on mesas and in valleys," and by Wilcox "at Fort Huachuca, Ariz."

Distribution: Southern Arizona southward into adjacent Sonora. A single arborescent shrub, apparently indigenous, was found by the writer on the sandy river bottom of the San Diego River, near Grantville, southwestern San Diego County. Lower Sonoran.

Specimens examined: Grantville, *Abrams 3753*.

3. STROMBOCARPUS. SCREW-BEAN.

1. STROMBOCARPUS PUBESCENS (Benth.) A. Gray; Torr. Pacif. R. Rep. **5**: 360. 1858.

Prosopis pubescens Benth. Lond. Journ. Bot. **5**: 82. 1846.
Prosopis Emoryi Torr. in Emory, Notes Mil. Reconnois. 139. 1848.
Prosopis odorata Torr. & Frem. in Frem. Second Rep. 313. 1845, in part.

Type locality: This species is said to have been collected in "California between San Miguel and Monterey," but the species has not since been found in that part of the State. Coulter, the collector, travelled southward from Monterey to Yuma, and it is probable that he obtained his specimens somewhere in the Colorado Desert along the old San Felipe and Yuma trail.

Distribution: From the interior and eastern parts of the Mohave Desert southward into Lower California and Sonora. Lower Sonoran.

Specimens examined: Near San Bernardino, *Parish*, July 8, 1898; *Abrams 2954;* Imperial Valley, near Calexico, *Abrams 3999.*

CAESALPINIACEAE. Senna Family.

Leaves simple, rounded; flowers resembling the papilionaceous, purple. 1. *Cercis.*

Leaves 1–2-pinnate; flowers regular, yellow.

  Pods not compressed, torose, gland on upper petal wanting. 2. *Parkinsonia.*

  Pod compressed, only slightly contracted between the seeds; gland on upper petal prominent. 3. *Cercidium.*

1. CERCIS. Red-bud.

1. Cercis occidentalis Torr.; A. Gray, Bost. Journ. Nat. Hist. **6**: 177. 1850.

Cercis californica Torr.; Benth. Pl. Hartw. 361. 1857.

Siliquastrum occidentale Greene, Man. Bay Region, 84. 1894.

Type locality: "Rocky plains of the Upper Guadaloupe."

Distribution: Lower edges of the Arid Transition from Sacramento Canyon and Mendocino County southward to the Cuiamaca Mountains, also in New Mexico and western Texas.

Specimens examined: Cuiamaca Mountains, between Cuiamaca and Oriflamme Mines, *Abrams 3924.*

2. PARKINSONIA.

Rachis flattened, much-elongated; leaflets scattered. 1. *P. aculeata.*

Rachis terete; leaflets in distinct pairs. 2. *P. microphylla.*

1. Parkinsonia aculeata L. Sp. Pl. 375. 1753.

Type locality: "Habitat in America calidiore."

Distribution: Valley of the Colorado River, northern Mexico and the lower Rio Grande; naturalized in the West Indies and the tropics of both hemispheres. Lower Sonoran and Tropical.

Specimens examined: I have not seen any specimens from southern California.

2. Parkinsonia microphylla Torr. Pacif. R. Rep. **4**: 82. 1857.

Type locality: "Banks of the Colorado [where it was collected by Mr. Schott near Fort Yuma] and on Williams River."

Distribution: Deserts of southern Arizona west to the Colorado Desert of southern California, and southward to adjacent Sonora and Lower California. Lower Sonoran.

Specimens examined: Diluvial banks of the Colorado, Ft. Yuma, *Schott*, Jan. 13, 1854.

3. CERCIDIUM. Palo verde.

1. Cercidium Torreyana (S. Wats.) Sargent, Gard. & For. **2**: 388. 1889.

Parkinsonia Torreyana S. Wats. Proc. Am. Acad. **11**: 135. 1876.

Type locality: "On the Lower Colorado River and in the valleys of western and southern Arizona."

Distribution: Colorado Desert and western Arizona southward into Sonora and Lower California. Lower Sonoran.

Specimens examined: The Needles, *Jones 3864;* Palm Springs, *Parish 4115;* Mecca, *Miss M. McKibben;* Coyote Canyon, *Hall 2790;* Salton, *Davey 8043*.

KRAMERIACEAE. Krameria Family.

1. KRAMERIA.

Prickles of the fruit barbed their whole length.	1. *K. parvifolia.*
Prickles of the fruit barbed only at apex.	2. *K. Grayi.*

1. Krameria parvifolia Benth. Bot. Voy Sulph. 6, *pl. 2*. 1844.

Type locality: "Bay of Magdalena," Lower California.

Distribution: Tia Juana southward into Lower California, and eastward to southern New Mexico and adjacent Sonora. Lower Sonoran.

Specimens examined: Rabbit Springs, Mohave Desert, *Parish 2334;* eastern base of San Jacinto Mountains, *Hall 2114;* San Felipe, *Thurber 632;* Jacumba Hot Spring, *Abrams 3662;* Cleveland's specimens from the vicinity of San Diego, which are cited in the "Botany of California," I have not seen.

2. Krameria Grayi Rose & Painter, Contr. Nat. Herb. **10**: 108. 1906.

Krameria canescens A. Gray, Pl. Wright. **1**: 42. 1852. Not Willd. 1825.

Type locality: "Prairies near the Pecos."

Distribution: Western borders of the Colorado Desert, southern California, eastward to New Mexico, and southward into adjacent Lower California and Sonora. Lower Sonoran.

Specimens examined: Morongo Canyon, *Parish 2979;* Signal Mountain, *Abrams 3170*, and Dec. 29, 1907; San Felipe, *Parry*, 1850.

FABACEAE. Pea Family.

- Leaves palmately foliate.
    - Flowers solitary. 1. *Xylothermia.*
    - Flowers racemose. 2. *Lupinus.*
- Leaves unequally or equally pinnate or rarely entire.
    - Flowers umbellate or solitary. 3. *Syrmatium.*
    - Flowers in spikes or racemes, not umbellate.
        - Herbage glandular-dotted.
            - Flowers racemose; wings and keel wanting. 4. *Amorpha.*
            - Flowers spicate or racemose; petals all present. 5. *Parosela.*
        - Herbage not glandular-dotted. 6. *Olneya.*

1. XYLOTHERMIA. Stingaree-bush.

- Twigs and leaves green and merely puberulent. 1. *X. montana.*
- Twigs and leaves canescent. 1*a*. *X. montana tomentosa.*

1. Xylothermia montana (Nutt.) Greene, Pittonia **2**: 188. 1891.

Pickeringia montana Nutt. in Torr. & Gray, Fl. N. Am. **1**: 389. 1840.

Type locality: "Summits of the mountains in the vicinity of St. Barbara, California."

Distribution: Islands off the coast of southern California, and on the mainland in the chaparral of the Coast Ranges from the vicinity of Santa Barbara, northward to Sonoma County, and in the Sierra Nevada at least as far north as Mariposa County. Upper Sonoran.

Specimens examined: Santa Cruz Island, *Brandegee;* La Cumbre Peak, Santa Ynez Mountains, *Abrams 4320.*

1*a*. Xylothermia montana tomentosa Abrams, Bull. Torrey Club **34**: 263. 1907.

Type locality: "Near El Nido, San Diego County."

Distribution: In the chaparral from the San Bernardino Mountains southward to near the National Boundary, and probably extending along the western slopes of the mountains of northern Lower California. Upper Sonoran.

Specimens examined: San Bernardino Mountains, altitude 1650 meters, *Parish 4990;* El Nido, *Abrams 3530.*

2. LUPINUS. Lupine.

Keel ciliate on the inner margin above the middle.
  Flowers yellow or sometimes purple; seeds dark brown, not mottled; leaves green, sparsely pubescent. 1. *L. arboreus.*
  Flowers purple; seeds mottled; leaves more or less canescent.
    Lower calyx-lobe entire; leaflets oblanceolate, acutish, 3–5 cm. long.
      Seeds 5 mm. long, dark gray, mottled with dark brown; pubescence of the branches and petioles short-villous, spreading. 2. *L. longifolius.*
      Seeds scarcely 4 mm. long, light tan, mottled with dark tan; pubescence of the branches and petioles appressed-silky. 3. *L. Brittoni.*
    Lower calyx-lobe 3-toothed; pubescence appressed-silky.
      Leaflets spatulate, rounded or very obtuse at apex, longest 2.5 cm. long ; bractlets 5–6 mm. long. 4. *L. Hallii.*
      Leaflets narrowly oblanceolate, obtuse or acutish, mostly 3–4 cm. long; bractlets 10–12 mm. long. 5. *L. Douglasii.*
Keel glabrous; herbage densely silky-pubescent. 6. *L. Chamissonis.*

1. Lupinus arboreus Sims, Bot. Mag. **18**: *pl. 682.* 1803.

Type locality: "Its native country is unknown to us." Probably collected at San Francisco or Monterey.

Distribution: Vicinity of the coast from San Francisco south to Santa Barbara. Upper Sonoran.

Specimens examined: Vicinity of Santa Barbara, *Elmer 3843.*

2. Lupinus longifolius (S. Wats.) Abrams, Fl. Los Angeles, 209. 1904.

Lupinus Chamissonis longifolius S. Wats. Bot. Calif. **1**: 117. 1876.

Type locality: "From San Diego (*Cleveland*) to Ojai (*Peckham*), San Pascual (*Thurber*) and San Antonio River, *Brewer*."

Distribution: Slopes of the lower hills in the coastal region of southern California. Upper Sonoran.

Specimens examined: Los Angeles, *Lyon*, April, 1884; Little Santa Anita Canyon, *Abrams 2621;* Playa del Rey, *Abrams 2505;* Santa Monica Forestry Station, *Barber 44;* Santa Monica Mountains, *Abrams 1696;* San Pasqual, *Thurber 615;* San Diego, *Cleveland 720;* hillsides near Ysidora, *Abrams 3299.*

3. **Lupinus Brittoni** sp. nov.

Bushy and shrubby below, with long herbaceous branches, about 1 m. high; herbage appearing glaucescent with a minute appressed pubescence; petioles slender, exceeding the leaflets; leaflets 6–8, oblanceolate, 25–45 mm. long, acutish at apex, with a prominent recurved point; racemes 15–30 cm. long; many-flowered; flowers scattered or in approximate whorls; pedicels 5 mm. long; lower calyx-lobe entire, 7 mm. long; corolla (in dried specimens) 15 mm. long, violet-purple; keel ciliate toward the middle on the upper edges; pod 3 cm. long; seeds 5–6, scarcely 4 mm. long, nearly as wide, light tan, specked with dark tan.

Type collected by the writer (*3904*) in Cottonwood Valley, San Diego County, June 5, 1903, and deposited in the Herbarium of Stanford University.

The glaucescent instead of silvery herbage, the shorter and closely appressed pubescence of the pedicels and calyx, and the minute pale seeds, separate this species readily from true *L. albifrons* of central California. The characters given in the key contrast it with the other southern California members of this group.

4. Lupinus Hallii Abrams, Bull. Torr. Bot. Club **37**: 151. 1910.

Type locality: "Reche Canyon, altitude 400 meters, San Bernardino Mountains."

Distribution: Foothills of the San Gabriel and the San Bernardino Mountains. Upper Sonoran.

Specimens examined: Reche Canyon, altitude 400 meters, *Hall*, May 15, 1901; vicinity of San Bernardino, *Parish 4772;* Anaheim, *Baker 4102.*

5. Lupinus Douglasii Agardh, Syn. Gen. Lupin. 34. 1835.

Type locality: Collected by Douglas, probably near Monterey.

Distribution: Dry hillsides near Monterey southward to the Santa Ynez Mountains. Upper Sonoran.

Specimens examined: Fremont's Pass, Santa Ynez Mountains, *Mrs. Marshall*, July, 1907.

6. Lupinus Chamissonis Esch. Mem. Acad. Petersb. **10**: 288. 1826.

Type locality: "in Novae Californiae arenosis." This was probably collected at San Francisco.

Distribution: Along the seashore from San Francisco south to Orange County. Upper Sonoran.

Specimens examined: Playa del Rey, *Abrams 2502;* Santa Monica, *Hasse 4823;* Redondo, *Grant 724.*

3. SYRMATIUM. California broom.

Herbage nearly glabrous, not silky-pubescent.	
Calyx-teeth subulate, about 2 mm. long.	1. *S. glabrum.*
Calyx-teeth very short and triangular.	2. *S. junceum.*
Herbage appressed silky-pubescent.	3. *S. procumbens.*

1. Syrmatium glabrum Vogel, Linnaea **10**: 591. 1836.

Hosackia scoparia Nutt.; Torr. & Gray, Fl. N. Am. **1**: 325. 1838.

Hosackia glabra Torr. U. S. Expl. Exped. **17**: 274. 1874.

Lotus glaber Greene, Pittonia **2**: 148. 1890.

Type locality: "California." Probably collected in the vicinity of the old Russian settlement, near Bodega Bay.

Distribution: Common on dry hillsides and slopes, especially in chaparral, throughout the California Sub-area of the Upper Sonoran, from Mendocino County and the western slopes of the Sierra Nevada southward to northern Lower California.

The species of this genus here included are low broom-like suffrutescent plants, and not true shrubs.

Specimens examined: Santa Barbara, *Elmer 3881; Torrey 105;* Sulphur Mountain, near Santa Paula, *Abrams & McGregor 32;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 390;* Los Angeles, *Tracy & Evans*, July 5, 1887; foothills, near San Bernardino, *Parish 4776, S. B. & W. F. Parish 146;* San Diego, *Nuttall; Thurber 524; Orcutt*, Feb. 15, 1886; *Palmer 58;* Jacumba Hot Spring, *Abrams 3652.*

2. Syrmatium junceum (Benth.) Greene, Bull. Calif. Acad. **2**: 147. 1886.

Hosackia juncea Benth. Trans. Linn. Soc. **17**: 326. 1837.

Lotus junceus Greene, Pittonia **2**: 148. 1890.

Type locality: "California." Collected by Douglas, probably in the vicinity of Monterey.

Distribution: A maritime species occurring along the coast from Monterey to San Diego. It is closely related to *S. glabrum*, and possibly is only a form of that widely distributed and variable species. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall;* Playa del Rey, *Abrams 2518;* Del Mar, *Brandegee*, June 4, ——; San Diego, *Susan G. Stokes*, June 4, 1895; Tia Juana, *Abrams 3469*.

3. SYRMATIUM PROCUMBENS Greene, Bull. Calif. Acad. **2**: 148. 1886.

Hosackia procumbens Greene, Bull. Calif. Acad. **1**: 82. 1885.
Lotus procumbens Greene, Pittonia **2**: 149. 1890.

Type locality: "Tehachapi, Kern County."

Distribution: This species is confined chiefly to the piñon belt of the mountains surrounding the western end of the Mohave Desert. The original specimens from Tehachapi were described as prostrate, but in the Liebre Mountains the plants are erect. The species is undoubtedly closely related to *S. sericeum*, and probably will prove identical when that species becomes better known. Upper Sonoran.

Specimens examined: Tehachapi, *Brandegee*, May, 1889; Mount Pinos, *Elmer 3988;* near Lancaster, *Davidson*, May 10, 1893; Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 337;* Swartout Canyon, San Gabriel Mountains, *Hall 1254;* Burcham's ranch, Mohave River Canyon, *Parish 4858;* Tejon Pass, *Hall 6264*.

4. AMORPHA. FALSE INDIGO.

Twigs and leaf-rachis with prickle-like glands; calyx-teeth triangular-lanceolate, over half the length of the tube. 1. *A. californica.*
Twigs and leaf-rachis without prickle-like glands; calyx-teeth short-triangular. 2. *A. occidentalis.*

1. AMORPHA CALIFORNICA Nutt. in Torr. & Gray, Fl. N. Am. **1**: 306. 1838.

Type locality: "Santa Barbara; near the coast."

Distribution: In the chaparral of the coast slope of the southern California mountains, from the vicinity of Santa Barbara southward to San Pedro Martir Mountain. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall;* Mount Pinos, *Elmer 3950;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 130;* Mount Wilson, *Grant 39;* Little Santa Anita Canyon, San Gabriel Mountains, *Abrams 2622;* San Bernardino

Mountains, *Hall 1288;* Deep Creek, *Abrams & McGregor 731;* Hathaway Flat, San Bernardino Mountains, *Abrams & McGregor 806;* Santa Ana Mountains, *Abrams 1828.*

2. **Amorpha occidentalis** sp. nov.

Shrubby below, 2–3 meters high; flowering branchlets minutely pubescent; leaf-rachis sparsely pubescent, without pickle-like glands, bearing 8–10 pairs of leaflets; leaflets ovate to narrowly oblong, sparsely pubescent with short-appressed hairs, firm in texture, 2–4 cm. long; raceme 10–18 cm. long; pedicels 1.5 mm. long; calyx-tube nearly glabrous, scarcely 2 mm. long; calyx-teeth very short, triangular, densely short-villous; petal about 5 mm. long; mature fruit not seen.

This species has been understood as *A. californica* Nutt., but Nuttall's specimens in the Torrey Herbarium, although too young to determine accurately the character of the calyx-teeth, have prickle-like glands. Plants from Santa Barbara, the type locality, agreeing with Nuttall's as to prickle-like glands, have lanceolate calyx-teeth nearly equaling the tube. I have not seen the type of *A. hispidula* Greene, but the central California plants are less pubescent, and have relatively shorter calyx-teeth.

Type: San Diego River, near the Old San Diego Mission, *Abrams 3425*, May 6, 1903. Type specimen deposited in the Stanford University Herbarium.

Distribution: Foothills of the San Bernardino Mountains southward to San Diego, and probably adjacent Lower California. Upper and Lower Sonoran.

Specimens examined: Foothills, San Bernardino Mountains, *Parish*, June, 1900; Reche Canyon, San Jacinto Mountains, *Hall*, May 15, 1900; eastern base of the San Jacinto Mountains, *Hall 2121;* Janal, altitude 300 meters, *Susan G. Stokes*, June 19, 1895; San Diego, *Palmer 65;* Jacumba Hot Spring, *Cleveland*, July 3, 1884; Julian, *Dunn*, Aug. 1892.

5. PAROSELA. DALEA.

Leaves pinnate.
  Calyx hoary-tomentose, its lobes slender, equaling or exceeding the tube.
    Calyx 4–5 mm. long; spikes short, head-like. 1. *P. Emoryi.*
    Calyx 8–10 mm. long; spikes loose, 3–4 cm. long. 2. *P. arborescens.*
  Calyx appressed silky-pubescent to nearly glabrous, its lobes broad, usually shorter than the tube.
    Glands not prickle-like; branchlets appressed-pubescent.

Calyx densely appressed silky-pubescent. 3. *P. californica.*
Calyx sparsely appressed-pubescent. 4. *P. Fremontii.*
Glands prickle-like; branches hirsute. 5. *P. Saundersii.*
Leaves simple.
Herbage green and nearly glabrous; leaves narrowly linear. 6. *P. Schottii.*
Herbage hoary with a minute appressed pubescence. 7. *P. spinosa.*

1. PAROSELA EMORYI (A. Gray) Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.

Dalea Emoryi A. Gray, Mem. Am. Acad. II. **5**: 315. 1855.

Type locality: "On the desert table-lands of the Gila."

Distribution: Western borders of the Colorado Desert, eastward to southern Arizona, and southward into Lower California and Sonora. Lower Sonoran.

Specimens examined: Palm Springs, *Parish 4112;* Carriso Creek, *Abrams 3987;* Signal Mountain, *Abrams 3180*, and Dec. 29, 1907.

2. PAROSELA ARBORESCENS (Torr.) Heller, Cat. N. Am. Pl. ed. 2, 5. 1900.

Dalea arborescens Torr.; A. Gray, Mem. Am. Acad. II. **5**: 316. 1855.

Type locality: "Mountains of San Fernando, a southern branch of the Sierra Nevada, California."

Distribution: Apparently confined to the arid mountains and hills of the Mohave Desert. Lower Sonoran.

Specimens examined: Barstow Hills, Mohave Desert, *Hall 6160;* Black's ranch, 32 kilometers northwest of Barstow, *Hall & Chandler 6851.*

3. PAROSELA CALIFORNICA (S. Wats.) Vail, Bull. Torrey Club **24**: 17. 1897.

Dalea californica S. Wats. Proc. Am. Acad. **11**: 132. 1876.

Type locality: "Collected by Dr. Parry in the San Bernardino Mountains, California." According to the "Botany of California" Parry's specimens were collected "in dry washes in the San Bernardino Mountains, near Cajon Pass."

Distribution: Desert slopes of the San Bernardino and San Jacinto Mountains, eastward to southern Utah. Lower Sonoran.

Specimens examined: Canyon of the San Jacinto River, altitude 660 meters, *Hall 2008;* Banning, *Davidson*, June, 1892; Warren's Well, altitude 1160 meters, *Parish 2992;* Pipe Canyon, *Parish 2991;* no locality, *Parry & Lemmon 86;* Banning, *Davidson*, June, 1892.

4. PAROSELA FREMONTII (Torr.) Vail, Bull. Torrey Club **24**: 16. 1897.

Dalea Fremontii Torr.; A. Gray, Mem. Am. Acad. II. **5**: 316. 1855.

Type locality: "Mountains of the Pah-Utah country, S. W. California." This was collected by Fremont May 5, 1844, and according to Fremont's itinerary he was on what is now known as Muddy River a few miles above its junction with Virgin River, southern Nevada.

Distribution: Southern Utah and Nevada westward to the Providence Mountains. Lower Sonoran.

Specimens examined: Providence Mountains, *Brandegee*, May 24, 1902.

5. **Parosela Saundersii** (Parish).

Dalea Saundersii Parish, Bull. S. Calif. Acad. **2**: 83. 1903.

Type locality: "In desert sands, near Victorville, cir. 3000 ft. alt., in the Mohave Desert."

Distribution: Mohave Desert, southern California. Lower Sonoran.

Specimens examined: Near Victorville, *Hall 6197;* near Kane Springs, Ord Mountains, *Hall & Chandler 6826* (?).

6. PAROSELA SCHOTTII (Torr.) Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.

Dalea Schottii Torr. Bot. Mex. Bound. 53. 1859.

Type locality: "Diluvial banks of the Colorado."

Distribution: Western borders of the Colorado Desert, eastward to southwestern Arizona. Lower Sonoran.

Specimens examined: Palm Springs, *Parish 4113; Hall 5758;* diluvial banks of the Colorado, *Schott*, Feb. 1855; Chuckawalla Mountains, *Hall 5973;* Borregos Springs, *Brandegee*, April 29, 1894.

7. Parosela spinosa (A. Gray) Heller, Cat. N. Am. Pl. ed. 2, 7. 1900.

Dalea spinosa A. Gray, Mem. Am. Acad. II. **5**: 315. 1855.
Asagraea spinosa Baillon, Adansonia **9**: 233. 1870.

Type locality: "Arroyos on the Gila; and on the California desert west of the Colorado."

Distribution: Western borders of the Colorado Desert, and extending eastward to southern Arizona, and southward into Lower California. Lower Sonoran.

Specimens examined: Palm Springs, *Hall 5758;* Carriso Creek, *Abrams 3980.*

6. OLNEYA. Ironwood.

1. Olneya Tesota A. Gray, Mem. Am. Acad. II. **5**: 328. 1855.

Type locality: "On the table-lands of the Gila," and "near Bill Williams' Fork," Arizona.

Distribution: The Colorado Desert of southern California, eastward into Arizona, and southward into Lower California and Sonora. Lower Sonoran.

Specimens examined: Signal Mountain, *Abrams*, Dec. 29, 1907.

ZYGOPHYLLACEAE. Caltrop Family.

1. COVILLEA. Creosote-bush.

1. Covillea tridentata (Moc. & Sesse) Vail, Bull. Torr. Bot. Club **26**: 302. 1899.

Zygophyllum tridentatum Moc. & Sesse; DC. Prod. **1**: 706. 1824.
Zygophyllum californicum Torr. & Frem. in Frem. Second Rep. 257. 1845.

Type locality: "In regno Mexicano."

Distribution: The most common and widely distributed shrub of the desert districts of southern California, extending eastward to western Texas, and southward through the arid regions of Mexico and Lower California. Lower Sonoran.

Specimens examined: Willow Springs, *Abrams & McGregor 424;* Lancaster, *Elmer 3664;* Cushenberry Springs, *Abrams 2147;* Imperial Junction (Old Beach), *Abrams 3202;* Jacumba Hot Spring, *Abrams 3675.*

RUTACEAE. Rue Family.

Leaves alternate; fruit a 2-lobed coriaceous capsule.	1. *Thamnosma.*
Leaves opposite; fruit a drupe.	2. *Cneoridium.*

1. THAMNOSMA.

1. Thamnosma montanum Torr. & Frem. in Frem. Second Rep. 313. 1845.

Type locality: "Passes of the mountains, and on the Virgin river in Northern California."

Distribution: Western borders of the Colorado Desert, extending southward into northern Lower California, and eastward to Arizona and southern Utah.

Specimens examined: Mission Creek bench, eastern base of the San Bernardino Mountains, *Parish 2987;* Jacumba Hot Spring, *Abrams 3651.*

2. CNEORIDIUM.

1. Cneoridium dumosum (Nutt.) Hook. f.; Brew. & Wats. Bot. Calif. **1**: 97. 1876.

Pitavia dumosa Nutt.; Torr. & Gray, Fl. N. Am. **1**: 215. 1838.

Type locality: "St. Diego, California."

Distribution: One of the principal components of the chaparral in the vicinity of San Diego, extending south into northern Lower California, and eastward on the desert slopes of the Cuiamaca and the San Jacinto Mountains; also in Arizona. Lower Sonoran.

Specimens examined: Near San Dieguito (Bernardo), *Abrams 3378;* Valley Center, *McClatchie*, March, 1893.

POLYGALACEAE.

1. POLYGALA.

1. Polygala cornuta Kell. Proc. Calif. Acad. **1**: 62. 1855.

Polygala californica Nutt. Torr. & Gray, Fl. N. Am. **1**: 671. 1840, as a synonym.

Polygala Fishiae Parry, Proc. Davenp. Acad. **4**: 39. 1884.

Type locality: Placerville.

Distribution: Sierra Nevada and the mountains of Santa Barbara County, southward to Lower California. A slender, sparsely branched, shrubby plant often growing a meter or more high. Upper Sonoran.

Specimens examined: Near Santa Barbara, *Torrey 74;* San Gabriel Mountains near Pasadena, altitude 1200 meters, *McClatchie*, July, 1893; Sierra Madre and Mount Wilson trail, altitude 1200 meters, *Abrams*, July, 1906; Canyon back of Monrovia, *Dudley*, Dec. 1907.

EUPHORBIACEAE. SPURGE FAMILY.

Flowers not in involucres; perianth evident, of several segments.
  Flowers dioecious; herbage densely stellate-pubescent. 1. *Bernardia.*
  Flowers monoecious; herbage not stellate-pubescent.
    Staminate flowers uppermost; herbage pubescent with simple hairs; leaves ovate, crenate-serrate. 2. *Acalypha.*
    Pistillate flowers uppermost; leaves large, palmately lobed; glabrous. 3. *Ricinus.*
Flowers in involucres; perianth represented by a minute scale at the base of a filament-like pedicel. 4. *Tricherostigma.*

1. BERNARDIA.

1. BERNARDIA MYRICAEFOLIA. (Scheele) S. Wats. Bot. Calif. **2**: 70. 1880.

Tyria myricaefolia Scheele, Linnaea **25**: 581. 1852.
Ricinella myricaefolia Muell. Arg. Linnaea **34**: 153. 1865.

Type locality: "An Waldrändern auf felsigem Boden, nördlich von Neubraunfels, am Rande der Hochebene."

Distribution: Mohave and Colorado Deserts, eastward to western Texas and northern Mexico. Lower Sonoran.

Specimens examined: San Felipe, *Parry*, 1850.

2. ACALYPHA.

1. ACALYPHA CALIFORNICA Benth. Bot. Sulph. 51. 1844.

Type locality: "Bay of Magdelena," Lower California.

Distribution: Southwestern San Diego County southward at least to Magdalena Bay. Lower Sonoran.

Specimens examined: Poway, *Parish 4430;* near San Dieguito, *Abrams 3388;* between Jamul and Jamacha, *Abrams 3744.*

3. RICINUS. CASTOR BEAN.

1. RICINUS COMMUNIS L. Sp. Pl. 1007. 1753.

Type locality: "Habitat in India utraque, Africa, Europa australi."

Distribution: The castor bean has become fairly well naturalized in many parts of southern California, and often develops into small trees, 4–5 meters high.

4. TRICHEROSTIGMA.

1. **Tricherostigma miserum** (Benth.) Kl. & Garcke, Monatsb. Akad. Berl. 248. 1859.

Euphorbia misera Benth. Bot. Sulph. 51. 1844.

Type locality: "San Diego," California, and "San Quentin," Lower California.

Distribution: On bluffs near the sea at San Diego, southward through western Lower California, and also on the islands off the coast of southern California. Lower Sonoran.

Specimens examined: Santa Catalina Island, *Blanche Trask*, Dec. 1900; San Diego, *Parry*, 1850; *Palmer 452; Pringle*, May, 1882; *Jones*, 1882; Point Loma, *Abrams 3458*.

BUXACEAE. Box Family.

1. SIMMONDSIA.

1. **Simmondsia californica** Nutt. Lond. Journ. Bot. **3**: 401, *pl. 16*. 1844.

Type locality: "Covering the sides of barren hills, in argillaceous soils, near the sea, in the vicinity of St. Diego in Upper California."

Distribution: Vicinity of San Diego, southward through northern Lower California, and eastward to Arizona. Lower Sonoran.

Specimens examined: Oneonta, *Herre*, Aug., 1902; Mission Hills, San Diego, *Abrams 3424;* San Diego, *Palmer 356; Parry*, 1850.

ANACARDIACEAE. Sumac Family.

Leaves compound, deciduous.
  Fruit glabrous; nut globose, striate. 1. *Toxicodendron.*
  Fruit viscid-pubescent and often villous; nut flattened, smooth. 2. *Schmaltzia.*
Leaves simple, evergreen; nut smooth.
  Flowers in dense racemes; fruit pubescent; pericarp viscid, acid. 3. *Neostyphonia.*
  Flowers in compound panicles; fruit small, glabrous; pericarp mealy. 4. *Lithraea.*

1. TOXICODENDRON. Poison oak.

1. Toxicodendron diversifolium (Torr. & Gray) Greene, Leaflets **1**: 119. 1905.

Rhus diversiloba Torr. & Gray, Fl. N. Am. **1**: 218. 1838.

Type locality: "Borders of woods, etc. Oregon," and "California."

Distribution: Western Washington, southward to northern Lower California. Several species have been segregated from this by Greene but I can detect no specific differences between the specimens which I have cited and those from farther north. In any section there is marked variation in the foliage and pubescence, so that these characters cannot be relied upon, within certain limits, in making specific distinctions. Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 3940;* Fort Tejon, *Abrams & McGregor 298;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 144;* Sulphur Mountain, *Abrams & McGregor 46;* San Gabriel, *Bigelow*, 1854; Pasadena, *Jones 3206.*

Rhus glabra L. has been reported by Parish (Bot. Gaz. **38**: 461) from "Chino Cañon, near Palm Springs, at the desert base of San Jacinto Mt.," where it was collected by *Hasse.*

2. SCHMALTZIA. Squaw berry.

Fruit not villous.	1. *S. cruciata.*
Fruit villous.	
Herbage minutely puberulent.	2. *S. straminea.*
Herbage densely soft-pubescent.	3. *S. malacophylla.*

1. Schmaltzia cruciata Greene, Leaflets **1**: 139. 1905.

Type locality: "Hot Springs in the northern part of San Diego Co., Calif."

Distribution: I have not been able to examine the original specimens upon which this species was based, nor have I seen any plants that answer the description. The validity of the numerous species proposed by Greene, for what has passed as *S. trilobata* (*Rhus trilobata*) can only be judged by thorough field work and the critical examinations of a large series of specimens. Upper Sonoran.

2. SCHMALTZIA STRAMINEA Greene, Leaflets **1**: 139. 1905.

Type locality: "Along Lytle Creek, San Gabriel Reserve, Calif."

Distribution: The puberulent form is apparently confined to the foothills and chaparral of the interior part of southern California. Upper Sonoran.

Specimens examined: Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 149;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 320.*

3. SCHMALTZIA MALACOPHYLLA Greene, Leaflets **1**: 138. 1905.

Type locality: "Griffith Park, Los Angeles Co., Calif."

Distribution: Apparently restricted to the coastal foothills. The lobation of the leaves is variable, and there seems to be no distinguishing characters between this and the preceding species except pubescence, the stability of which is doubtful. Upper Sonoran.

Specimens examined: North slope of the Santa Monica Mountains, between Encino and Cahuenga Pass, *Abrams 1310;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 3113;* Playa del Rey (Ballona Harbor), *Abrams 286;* Arroyo Seco, near Pasadena, *Grinnell*, July 30, 1903.

3. NEOSTYPHONIA. LEMONADE BERRY.

Leaves oval, very obtuse at both ends.	1. *N. integrifolia.*
Leaves ovate, acute at apex.	2. *N. ovata.*

1. NEOSTYPHONIA INTEGRIFOLIA (Nutt.) Shafer, in Britton, N. Am. Trees 612. 1908.

Styphonia integrifolia Nutt. Torr. & Gray, Fl. N. Am. **1**: 220. 1838.

Rhus integrifolia Benth. & Hook.; S. Wats. U. S. Geograph. Surv. 6: 84. 1878.

Styphonia serrata Nutt. in Torr. & Gray, Fl. N. Am. **1**: 220. 1838.

Type locality: "On the margins of cliffs near the sea around San Diego and Santa Barbara."

Distribution: Santa Barbara, southward through northern Lower California. In the northern part of its range it is confined to the sea-coast, but southward especially in San Diego County it extends inland even to the desert slopes of the Cuiamaca Mountains. Upper and Lower Sonoran.

Specimens examined: Santa Barbara, *Nuttall; Parry*, 1850; *Elmer 3898;* Los Angeles, *Franceschi*, 1893; Playa del Rey, *Abrams 287;* Big Tejunga Wash, San Fernando Valley, *Abrams 1385;* Claremont, *Baker 4156;* Ysidora, *Abrams 3307;* San Diego, *Brandegee* (distributed by *C. F. Baker 818*); *Herre*, July 23, 1902.

2. **Neostyphonia ovata** (S. Wats.).

Rhus ovata S. Wats. Proc. Am. Acad. **20**: 358. 1885.

Type locality: "On hills and mountains, away from the coast, from San Diego to Los Angeles County, the Cantillas Mountains in Lower California, and in Southern Arizona; also on Santa Catalina Island."

Distribution: Santa Ynez Mountains, southward through the chaparral belt of the coastal slope to northern Lower California; also on the islands of the coast of southern California, and in Arizona. Upper Sonoran.

Specimens examined: Santa Ynez Mountains, *Brandegee; Dunn*, 1891; *Elmer 3904*; San Fernando Mountains, near Chatsworth, *Abrams 1369;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2559;* Sawpit Canyon, San Gabriel Mountains, *Dudley*, Dec. 1907; hills near Monrovia, *Baker 4147;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 677;* Redlands, *Parish*, April 21, 1891; Fallbrook, *Jones 3318;* between Campo and Potrero, *Abrams 3719.*

4. LITHRAEA. CALIFORNIA SUMAC.

1. LITHRAEA LAURINA (Nutt.) Walp. Rep. **1**: 551. 1842.

Rhus laurina Nutt.; Torr. & Gray, Fl. N. Am. **1**: 219. 1838.

Type locality: "On bushy plains, near St. Barbara, California."

Distribution: Southern slopes of the Santa Ynez Mountains southward to northwestern Lower California, and on the islands as far south as Cedros Island. In southern California this species is confined chiefly to the lower portions of the chaparral belt. Upper and Lower Sonoran.

Specimens examined: Santa Barbara, *Elmer 4015;* Mountain Drive, Santa Barbara, *Abrams 4154;* Santa Monica Canyon, *Abrams 2192;* Scoville's Hill, Pasadena, *Grinnell*, July 3, 1903;

near San Gabriel, *Bigelow*, March 23, 1854; Little Santa Anita Canyon, San Gabriel Mountains, *Abrams 2639;* near Monrovia, *Dudley*, Dec. 8, 1907; hills near Elsinore Lake, *Dutton*, June 2, 1898; Jamul, *Susan G. Stokes*, June 19, 1895; San Diego, *Herre*, July 23, 1902; *Chandler 4122.*

RHAMNACEAE. BUCKTHORN FAMILY.

Fruit drupaceous, free from the calyx.	
Drupe enclosing a single stone.	1. *Condalia.*
Drupe enclosing 2–4 nutlets.	2. *Rhamnus.*
Fruit becoming nearly or quite dry, partly inferior.	
Calyx-lobes deciduous; style elongated, 3-lobed.	3. *Ceanothus.*
Calyx-lobes persistent; style short, notched.	4. *Adolphia.*

1. CONDALIA.

Petals none; sepals persistent; drupe 5 mm. long.	1. *C. spathulata.*
Petals present; sepals deciduous.	
Drupe 5 mm. long, beakless; herbage canescent.	2. *C. divaricata.*
Drupe 15 mm. long, beaked; herbage glabrous.	3. *C. Parryi.*

1. CONDALIA SPATHULATA A. Gray, Pl. Wright. **1**: 32. 1852.

Type locality: "On the Rio Grande, Texas; and prairies on the San Felipe."

Distribution: Southwestern Texas to the Colorado Desert of southern California. I have not seen any specimens of this from southern California, but according to Trelease (A. Gray, Syn. Fl. **1**, pt. 1: 403) it has been collected at Mesquite, *Parish 793.* Lower Sonoran.

2. CONDALIA DIVARICATA A. Nelson, Bot. Gaz. **47**: 427. 1909.

Zizyphus lycoides canescens A. Gray, U. S. Geog. Sur. **6**: 82. 1878.
Condalia lycoides canescens Trelease, A. Gray, Syn. Fl. **1**, pt. 1: 403. 1897.

Type locality: "Las Vegas, Nevada."

Distribution: Southern Nevada southward through western Arizona and the deserts of southern California to northern Lower California. Lower Sonoran.

Specimens examined: I have not seen any specimens from southern California, but according to Trelease (l. c.) it has been collected by Parish at Mammoth Tank in the Colorado Desert.

3. Condalia Parryi (Torr.) Weberbauer, in Engler & Prantl, Nat. Pflanzenf. **3**, ab. 5: 404. 1895.

Zizyphus Parryi Torr. Bot. Mex. Bound. 46. 1859.

Type locality: "Gravelly ravines near San Felipe, California."

Distribution: Western borders of the Colorado Desert southward to Lower California. Lower Sonoran.

Specimens examined: Morongo Canyon, altitude 1000 meters, *Parish 2969;* Whitewater Canyon, *Pringle*, March 25, 1882; San Felipe, *Parry*, 1850; Jacumba Hot Spring, *Abrams 3659.*

2. RHAMNUS. Buckthorn or Coffee berry.

Flowers polygamo-dioecious; petals none; leaves pungently toothed.
  Branches spinescent; leaves obovate, 6–12 mm. long; calyx-lobes triangular. 1. *R. crocea.*
  Branches not spinescent; leaves 12–40 mm. long; calyx-lobes lanceolate.
    Leaves becoming glabrous and shiny; anthers 1 mm. long. 2. *R. ilicifolia.*
    Leaves more or less pilose; anthers 0.5 mm. long. 3. *R. pilosa.*
Flowers perfect; petals minute, emarginate; leaves not pungently toothed.
  Leaves green and glabrous beneath. 4. *R. californica.*
  Leaves canescent beneath.
    Leaves entire, tomentulose beneath. 5. *R. tomentella.*
    Leaves serrulate, hirsutulose beneath. 6. *R. cuspidata.*

1. Rhamnus crocea Nutt. in Torr. & Gray, Fl. N. Am. **1**: 261. 1838.

Type locality: "Around Monterey, California."

Distribution: Coast Ranges of central California, southward to northern Lower California. In southern California it occurs on dry exposed ridges in the lower part of the chaparral belt, especially on the footslopes of the mountains. Upper and Lower Sonoran.

Specimens examined: Montecito, *Franceschi*, 1894; Big Tejunga Wash, *Abrams 1370;* Arroyo Seco, near Pasadena, *Grinnell*, July 30, 1903; mesas near San Bernardino, *Parish*, May 26, 1898; San Diego, *Jones 3087; Brandegee*, 1889; Coronado, *Dunn*, April 7, 1891; Tia Juana, *Abrams 3499.*

2. Rhamnus ilicifolia Kell. Proc. Calif. Acad. **2**: 37. 1863.

Rhamnus crocea ilicifolia Greene, Fl. Fran. 79. 1891.

Type locality: "Vicinity of Clear Lake."

Distribution: Coast Ranges from Lake County southward to the southern boundary of the State. In southern California this is a larger, less rigid bush than *R. crocea*, with leaves that very closely resemble those of *Laurocerasus ilicifolia.* It is a common shrub in the chaparral belt of the coastal slope. Upper Sonoran·

Specimens examined: Santa Barbara, *Parry*; Santa Ynez Mountains, *Brandegee*, May, 1888; Sulphur Mountain Spring, *Abrams & McGregor 39;* Saugus, *Elmer 3649;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 3114;* Pasadena, *Brandegee*, May, 1888; San Gabriel Canyon, *Abrams 1020;* Claremont, *Baker 3653;* Pasadena, *Grinnell*, Aug. 1, 1903; Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 333;* Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 710*; Temecula Canyon, *Greene*, June, 1889; Campo, *Abrams 3587.*

3. RHAMNUS PILOSA (Trelease) Abrams, Bull. Torr. Bot. Club **37**: 153. 1910.

Rhamnus crocea pilosa Trelease; Curran, Proc. Calif. Acad. II. **1**: 251. 1888.

Type locality: "Santa Maria Valley, in the mountains back of San Diego."

Distribution: Mountains and foothills of San Diego County. Upper Sonoran.

Specimens examined: Mountains east of San Diego, *Parry*, 1859; San Diego, *Parry;* 1850; vicinity of San Ysabel, *Henshaw 235;* San Felipe, *Susan G. Stokes*, July 26, 1895.

4. RHAMNUS CALIFORNICA Esch. Mem. Acad. Petersb. **10**: 285. 1823.

Rhamnus oleifolia Hook. Fl. Bor. Am. **1**: 123, *pl. 44.* 1833.
Endotropis oleifera Raf. Sylva Tellur. 31. 1838.
Rhamnus laurifolius Nutt. in Torr. & Gray, Fl. N. Am. **1**: 260. 1848.
Perfonon laurifolium Raf. Sylva Tellur. 29. 1838.
Frangula californica A. Gray, Gen. Ill. **2**: 178. 1849.
Rhamnus Purshiana californica Rehder, in Bailey, Cyclop. Am. Hort. 1510. 1902.

Type locality: "In Novae Californae fruticetis."

Distribution: In the Coast Ranges, from Mendocino County southward to San Bernardino County. In southern California this is a common shrub in the chaparral on the mountains and foothills, especially toward the coast. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall; Torrey*, 1850; Pasadena, *Jones*, May 8, 1882; Sepulveda Canyon, Santa Monica Mountains, *Abrams 2541;* Claremont, *Baker 3443;* San Gabriel Canyon, *Leiberg 3404;* Arroyo Seco, above Devil's Gate, *Abrams 1427;* Mill Creek, San Bernardino Mountains, *Abrams & McGregor 822;* Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 709.*

5. RHAMNUS TOMENTELLA Benth. Pl. Hartw. 303. 1848.

Rhamnus californica tomentella Brew. & Wats. Bot. Calif. **1**: 101. 1876.

Rhamnus Purshiana tomentella K. Brand. Zoe **1**: 244. 1890.

Type locality: "In montibus Sacramento."

Distribution: In the chaparral belt of the Sierra Nevada, extending southward to northern Lower California, and eastward to Arizona. In southern California this species replaces *R. californica* on the more interior mountains away from the influence of the coast fogs. Upper Sonoran.

Specimens examined: Mount Pinos, *Elmer 3817;* Sespe Creek, near Ten Sycamore Flat, *Abrams & McGregor 166;* Sisar Canyon, Topatopa Mountains, *Abrams & McGregor 66;* foothills of the San Bernardino Mountains, *Parish*, June 26, 1898; San Diego, *Parry*, 1850; Palomar Mountain, *McClatchie*, July, 1896; near Foster's, *Abrams 7371;* Cuiamaca Mountains, between Julian and Cuiamaca, *Abrams 3962;* Buckman's Springs, *Susan G. Stokes*, July 18, 1895; hills near Campo, *Abrams 3695.*

6. RHAMNUS CUSPIDATA Greene, Leaflets **1**: 64. 1904.

Type locality: "Near Tehachapi."

Distribution :Tehachapi Mountains, southward along the desert slopes of the San Gabriel and the San Bernardino Mountains. Upper Sonoran.

Specimens examined: Rock Creek, *Abrams & McGregor 532, 621;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 327;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 664;* Hathaway Flat, San Bernardino Mountains, *Abrams & McGregor 809.*

3. CEANOTHUS. Wild lilac.

**Stipules thin and mostly fugacious; leaves alternate; capsules without dorsal or apical horns; flowers racemose or paniculate.*

Leaves deciduous, entire, pinnately veined, or somewhat 3-nerved in the first species; twigs not at all spinescent; flowers white, paniculate.

Leaves ovate, pubescent above; capsule smooth, slightly crested, 4–5 mm. broad. 1. *C. integerrimus puberulus.*

Leaves elliptic, glabrous above; capsules roughened, rather prominently crested, 7 mm. broad. 2. *C. Palmeri.*

Leaves evergreen; flowers blue or rarely white.

Leaves pinnately veined, elliptic, entire; twigs slender, spinescent; arborescent shrub. 3. *C. spinosus.*

Leaves 3-nerved, ovate-lanceolate to ovate.

Twigs stiff and spinescent; leaves entire and glabrous (except in no. 5).

Erect branching shrubs, racemes elongated.

Leaves often sparsely glandular-toothed, pubescent above. 4. *C. divaricatus.*

Leaves entire, glabrous above. 4*a*. *C. divaricatus eglandulosus.*

Spreading, flat-topped shrub; twigs pale oi olive color; raceme short, spreading. 5. *C. cordulatus.*

Twigs not at all spinescent; leaves glandular-toothed, pubescent.

Large arborescent shrubs or small trees.

Capsules glabrous.

Leaves glabrous above. 6. *C. sorediatus.*

Leaves pubescent above.

Leaves minutely velvety-pubescent above, densely white-tomentose beneath. 7. *C. tomentosus.*

Leaves somewhat hirsute above, not velvety, hirsute beneath; twigs hirsute or villous. 8. *C. oliganthus.*

Capsules glandular-villous; leaves and twigs pubescent. 9. *C. Orcuttii.*

Low shrubs, 3–10 dm. high.

Leaves elliptic or narrowly ovate, 2 cm. long or less. 10. *C. austro-montanus.*

Leaves round-ovate, their veins deeply impressed on the back, 1 cm. long or less, villous. 11. *C. impressus.*

***Stipule-bases persistent, thick and corky or spongy; capsule usually with dorsal or apical horns as well as crests; flowers umbellate, white or rarely blue* (no. 15).

Leaves alternate.

Leaves narrowly obovate, cuneate, entire; capsule 7–10 mm. broad, horns dorsal, stout. 12. *C. megacarpus.*

Leaves broadly obovate, usually denticulate; capsule 6 mm. broad, neither crested nor horned. 13. *C. verrucosus.*

Leaves opposite.

Horns of capsules dorsal, spreading, slender; leaves usually toothed, often concave, tomentose to nearly glabrous above. 14. *C. vestitus.*

Horns near the summit, erect.

Leaves pungently toothed; horns stout.

Twigs and leaves glabrous or sparsely pubescent, the latter prominently toothed and holly-like; flowers blue. 15. *C. Jepsoni.*

Twigs and under surface of leaves tomentose, the latter with shallow teeth; flowers white.

Venation on under surface of leaves hidden by the dense tomentum; leaves strongly revolute. 16. *C. crassifolius.*

Venation distinct through the fine tomentum; leaves not revolute. 16*a*. *C. crassifolius planus.*

Leaves entire; canescent below, with short, incurved hairs; horns rather slender. 17. *C. cuneatus.*

1. **Ceanothus integerrimus puberulus** (Greene).

Ceanothus puberulus Greene, Leaflets **1**: 66. 1904.

Type locality: "Altitude of 4000 and 5000 feet in the San Bernardino Mountains."

Distribution: Frazier Mountain southward to the San Jacinto Mountains. Transition.

This southern plant differs from the typical form in being pubescent on the upper surface of the leaves, since this character is not constant its true relation seems best expressed in the varietal rank.

Specimens examined: Goodnough Meadow, *Dudley 4755;* canyon near Elizabeth Lake, *Dudley 4419;* Liebre Mountain, *Abrams & McGregor 369;* Mount Gleason, *Elmer 3595;* Mount Wilson, *Grant 149;* North Baldy, altitude 1800 meters, *Abrams & McGregor 585;* Lytle Creek Canyon, 1740 meters, *Hall*, May, 1899; Cañon Diablo, *Parish 4693;* Huston's Flat, *Shaw & Illingsworth 157;* Cleghorn Canyon, *Abrams & McGregor 712;* Hathaway Flat, *Abrams & McGregor 810;* summit of Mount Santiago, *Abrams 1843.*

2. CEANOTHUS PALMERI Trelease, Proc. Calif. Acad. II. **1**: 109. 1888.

Ceanothus spinosus Palmeri K. Brand. Proc. Calif. Acad. II. **4**: 185. 1894.

Type locality: "Mountains of Southern California (Palmer, 1875, 42)."

Distribution: Mountains of Ventura County and the Cuiamaca Mountains. Transition.

Specimens examined: Topatopa Mountains, *Abrams & McGregor 123;* Cuiamaca Mountains, *Palmer 23;* Cuiamaca, *Brandegee*, June 15, 1894, and June 3, 1896; Middle Peak, Cuiamaca Mountains, *Abrams 3853.*

3. CEANOTHUS SPINOSUS Nutt. in Torr. & Gray, Fl. N. Am. **1**: 1838. 267.

Type locality: "Mountains of St. Barbara."

Distribution: Mountains of southern California, toward the coast, from Santa Barbara County south to Orange County. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall; Parry*, 1850; *Elmer 3917; Franceschi*, April 4, 1894; Lockwood Creek, *Dudley*, June, 1896; Sepulveda Canyon, Santa Monica Mountains, *Abrams 291, 3115;* near Los Angeles, *Davidson*, 1891; Trabuco Canyon, Santa Ana Mountains, *Abrams 1854.*

4. CEANOTHUS DIVARICATUS Nutt. in Torr. & Gray, Fl. N. Am. **1**: 266. 1838.

Type locality: "Mountains of St. Barbara, California, and also near the town."

Distribution: Mountains of Monterey County, southward to the San Bernardino Mountains. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall; Douglas; Brewer 286;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 157;* Sisar Canyon, altitude 1050 meters, *Abrams & McGregor 63;* Hines Peak, Topatopa Mountains, *Abrams & McGregor 83;* Cold Creek, San Bernardino Mountains, altitude 1500 meters, *Abrams & McGregor 828.*

4*a*. CEANOTHUS DIVARICATUS EGLANDULOSUS Torr. Pacif. R. Rep. **4**: 75. 1857.

Ceanothus eglandulosus Trelease, Proc. Calif. Acad. II. **1**: 10. 1888.

Ceanothus leucodermis Greene, Kew Bull. **1895**: 15. 1895.

Type locality: "On mountains near San Gabriel" and "Cohon Pass."

Distribution: Liebre Mountains, southward to northern Lower California. This is one of the characteristic shrubs of the chaparral on the interior mountains in southern California. Upper Sonoran.

Specimens examined: Near San Gabriel, *Bigelow*, March 22, 1853 (type); Sawpit Canyon, San Gabriel Mountains, *Dudley*, Dec. 1907; Mount Wilson trail, *Abrams*, July 19, 1906; near the summit of Mount Wilson, *Abrams 2609;* Mount Gleason, *Elmer 3610;* Big Tejunga Wash, *Abrams 1371;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 328;* Cajon Pass, *Bigelow*, 1853; Cañon Diablo, *Parish 4694;* Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 711;* Santa Ana Mountains near Elsinore, *Baker 4144; Abrams*, July 21, 1908; Nuevo, *Brandegee 10;* Cottonwood grade, near Potrero, *Abrams 3731.*

5. CEANOTHUS CORDULATUS Kell. Proc. Calif. Acad. **2**: 124, *pl. 39.* 1861.

Type locality: "Brought by Dr. J. A. Veatch from Washoe."

Distribution: Sierra Nevada Mountains, southward through the mountains of southern California, where it is rather common in the higher altitudes of the Transition and Canadian Zones.

Specimens examined: North Baldy, altitude 2250 meters, *Abrams & McGregor 618;* Mount San Antonio, altitude 2000 meters, *Hall 1217;* near Bear Valley, *Abrams 2866;* Mount San Antonio, *Abrams 2706;* Mount San Jacinto, *Hasse 5660.*

6. CEANOTHUS SOREDIATUS Hook. & Arn. Bot. Beech. 328. 1840.

Type locality: Collected by Douglas in California.

Distribution: Coast Ranges of central California from Solano County southward to northern Santa Barbara County, also in the San Gabriel Mountains. Upper Sonoran.

Specimens examined: Sawpit Canyon, San Gabriel Mountains, *Dudley*, Dec. 1907.

7. CEANOTHUS TOMENTOSUS Parry, Proc. Davenp. Acad. **5**: 190. 1889.

Ceanothus oliganthus tomentosus K. Brand. Proc. Calif. Acad. II. **4**: 198. 1894.

Type locality: "Brown sandstone ledges, Ione, Amador County."

Distribution: Foothills of the Sierra Nevada in Amador County, in the chaparral of the San Bernardino Mountains, and in the San Diego region. Upper Sonoran.

Specimens examined: Edgar Canyon, *Parish 4103;* Mill Creek Canyon, *Parish 2023, 2088;* Encinitas, *Brandegee*, March 28, 1894; San Diego, *Brandegee 33;* Nuevo, *Brandegee 36;* San Dieguito, *Abrams 3732;* Cottonwood grade, *Abrams 3379*.

8. CEANOTHUS OLIGANTHUS Nutt. in Torr. & Gray, Fl. N. Am. **1**: 266. 1838.

Ceanothus hirsutus Nutt. in Torr. & Gray, Fl. N. Am. **1**: 266. 1838.

Type locality: "Bushy woods on the hills of St. Barbara."

Distribution: In the chaparral of the mountains of Santa Barbara County, southward to the San Gabriel Mountains, where it extends at least as far eastward as Monrovia. This species is therefore confined chiefly to the coastal mountains. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall; Brewer 289; Franceschi*, April 2, 1894; *Brandegee 30;* Santa Ynez Mountains, *Elmer 3776; Abrams*, March 6, 1909; Pasadena, *Brandegee 31;* Mount Wilson trail, *Abrams 1504;* Millard's Canyon, *Abrams 292;* Sawpit Canyon, San Gabriel Mountains, *Dudley*, Dec., 1907.

9. CEANOTHUS ORCUTTII Parry, Proc. Davenp. Acad. **5**: 193. 1889.

Ceanothus hirsutus Orcuttii Trelease, in A. Gray, Syn. Fl. **1**, pt. 1: 414. 1897.

Type locality: "High Mountains east of San Diego, C. R. Orcutt."

Distribution: Cuiamaca Mountains of San Diego County. Borders of the Transition and Upper Sonoran.

Specimens examined: Nuevo, *Brandegee 32;* between Julian and Cuiamaca, *Abrams 3965*.

10. **Ceanothus austro-montanus** sp. nov.

Low, erect shrub, 3 meters high or less; branchlets reddish or grayish-brown, short-pubescent and glandular; petioles 3 mm. long or less; leaves oblong to narrowly ovate, 8–12 mm. long, 4–6 mm. wide, conspicuously glandular-toothed, minutely appressed-pubescent above, pale beneath and pubescent on the veins; peduncles 3–5 cm. long; racemes a half to a third as long; fruiting pedicels 5 mm. long; calyx-lobes broadly triangular, nearly 2 mm. high; capsule 3 mm. broad, slightly longer, very shallowly lobed; dorsal crests inconspicuous.

Related to *C. foliosus* Parry of the North Coast Ranges (Marin to Mendocino Counties); but that species has a deeply lobed and relatively broader capsule, and smaller, narrower calyx-lobes.

Type: Coniferous forests, between Julian and Cuiamaca, *Abrams 3966*, July 1, 1903. The type specimen is deposited in the Stanford University Herbarium.

Distribution: Cuiamaca Mountains, southern California. Transition.

11. CEANOTHUS IMPRESSUS Trelease, Proc. Calif. Acad. II. **1**: 112. 1888.

Ceanothus dentatus impressus Trelease, in Gray, Syn. Fl. **1**: pt. 1: 415. 1897.

Type locality: "Santa Barbara County."

Distribution: Coastal region of Santa Barbara and San Luis Obispo Counties. Upper Sonoran.

Specimens examined: Surf, *Elmer 3870.*

12. CEANOTHUS MEGACARPUS Nutt. N. Am. Sylva, **5**: 46. 1846.

Ceanothus macrocarpus Nutt. in Torr. & Gray, Fl. N. Am. **1**: 267. 1838. Not Cav. 1794.

Type locality: "Mountains of St. Barbara, California."

Distribution: Mountains and foothills especially toward the coast, from Santa Barbara south to the Santa Monica Mountains. Upper Sonoran.

Specimens examined: Santa Barbara, *Nuttall; Brandegee 89; Elmer 3869;* Mountain Drive, *Abrams 4124;* Santa Catalina Island, *Brandegee 88;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2560.*

13. CEANOTHUS VERRUCOSUS Nutt. in Torr. & Gray, Fl. N. Am. **1**: 267. 1838.

Type locality: "Low hills near the coast, St. Diego, California."

Distribution: Dry mesas and hills in the vicinity of San Diego, and southward into northern Lower California. Lower Sonoran.

Specimens examined: San Diego, *Nuttall; Parry*, 1850; Encinitas, *Brandegee 91;* hills near San Dieguito, *Abrams 3739;* mesas near San Diego, *Susan G. Stokes*, May 28, 1895.

14. CEANOTHUS VESTITUS Greene, Pittonia 2: 101. 1890.

Type locality: "Borders of pine forests on the mountains near Tehachapi, Kern Co., Calif."

Distribution: Southern Nevada, southward to the San Bernardino Mountains. In southern California this species is confined chiefly to the desert slopes of the mountains in the piñon belt. Upper Sonoran.

Specimens examined: Mount Pinos, altitude 1800 meters, *Abrams & McGregor 260;* Pine Creek near Mutau Flat, *Abrams & McGregor 194;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 334;* Rock Creek, *Abrams & McGregor 567;* eastern slope of Mount San Antonio, altitude 2400 meters *Abrams 2717;* eastern base of the San Jacinto Mountains *Hall 2156;* Cahuilla Valley, *Hall 1164;* San Felipe Canyon, *Brandegee 114;* between Campo and Jacumba Hot Spring, *Abrams 3700.*

15. CEANOTHUS JEPSONI Greene, Man. Bay-Region 78. 1894.

Type locality: "Open hills in Marin Co., near San Geronomo, and northward."

Distribution: This species has only been known from the Coast Ranges north of San Francisco Bay, but the specimens cited below seem identical. The species is closely related to *C. pinetorum* of the southern Sierra Nevada, but that has much more prominent stipules. Upper Sonoran.

Specimens examined: Hills west of Pomona, *Baker 4001.*

16. CEANOTHUS CRASSIFOLIUS Torr. Pacif. R. Rep. 4: 75. 1857.

Type locality: "Mountains south of Los Angeles."

Distribution: A common shrub in the chaparral from Santa Barbara County, southward to northern Lower California. Upper Sonoran.

Specimens examined: Newhall, *Brandegee 85;* Mount Lowe, *Grant 1147;* San Fernando Mountains, near Chatsworth, *Abrams 1364;* Cajon Pass, *Bigelow*, March 16, 1853; Beaumont, *Parish 4104,* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 672;* Santiago Canyon, *Helen D. Geis*, April, 1902; near Foster's, *Abrams 3767;* Nuevo, *Brandegee 84.*

16*a*. **Ceanothus crassifolius planus** var. nov.

Like the type in structural characters but leaves not revolute on the margin, and much less tomentose beneath, the venation being very evident through the sparse tomentum. An apparent geographic variation.

Type: Red Reef Canyon, Topatopa Mountains, Ventura County, *Abrams & McGregor 124*, June 8, 1908. The type specimen is deposited in the Stanford University Herbarium.

Distribution: Mountains of Santa Barbara and Ventura Counties. Upper Sonoran.

Specimens examined: Santa Ynez Mountains, *Elmer 3758;* near Sespe Hot Springs, *Dudley 4777;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 124.*

17. CEANOTHUS CUNEATUS (Hook.) Nutt. in Torr. & Gray, Fl. N. Am. **1**: 267. 1838.

Rhamnus cuneatus Hook. Fl. Bor. Am. **1**: 124. 1829.

Type locality: "Near the sources of the Multonomak River, in sandy soils growing under the shade of *Pinus Lambertiana.*"

Distribution: Southern Oregon southward throughout California. Upper Sonoran.

Specimens examined: Vicinity of Fort Tejon, *Abrams & McGregor 295;* Cuddy's ranch, *Dudley 4485;* Sisar Canyon, Topatopa Mountains, *Abrams & McGregor 67;* near Azusa, *Abrams 3128;* Elizabeth Lake, *Abrams & McGregor 410;* Colton, *Jones 3176;* San Bernardino, *S. B. & W. F. Parish 1015;* Claremont, *Baker 237;* hills near Campo, *Abrams 3500;* San Clemente Island, *Blanche Trask 198.*

4. ADOLPHIA.

1. ADOLPHIA CALIFORNICA S. Wats. Proc. Am. Acad. **11**: 126. 1876.

Type locality: "At Solidad and Chollas Valley, near San Diego and near Monterey." The last station is unquestionably an error.

Distribution: From the vicinity of San Diego southward through northern Lower California. Lower Sonoran.

Specimens examined: Near San Diego, *Parry*, 1850; Soledad *Palmer 44; Jones 3132;* Chollas Valley, *Cleveland;* Tia Juana, *Abrams 3481.*

VITACEAE. Grape Family.

1. VITIS. Grape.

1. Vitis Girdiana Munson, Proc. Soc. Prom. Agr. Sci. 59. 1887.

Type locality: "San Diego Co." and "Los Angeles Co. California."

Distribution: Along streams on the coastal and desert slopes of the southern California mountains, from Santa Barbara southward. Upper Sonoran.

Specimens examined: Sawpit Canyon, San Gabriel Mountains, *Alice Cooper*, Oct. 4, 1908; near Monrovia, *Dudley*, Nov. 1907; Lytle Creek Canyon, *Abrams 1955;* West Fork of Deep Creek, San Bernardino Mountains, *Abrams & McGregor 723;* vicinity of San Bernardino, *Parish 5013;* Jamul Valley, *Susan G. Stokes*, June 19, 1895; between Foster's and Ramona, *Abrams 3766.*

MALVACEAE. Mallow Family.

Stigmas linear. 1. *Lavatera.*
Stigmas capitate.
  Seeds not comose; fruit with a central axis. 2. *Malacothamnus.*
  Seeds comose; fruit without a central axis. 3. *Hibiscus.*

1. LAVATERA. Tree mallow.

1. Lavatera assurgentiflora Kell. Proc. Calif. Acad. **1**: 14. 1854.

Type locality: "Island of Anacapa, off the coast of Santa Barbara."

Distribution: A native of the islands off the coast of southern California; cultivated on the mainland where it sometimes appears as an escape.

2. MALACOTHAMNUS. Bush mallow.

Calyx and herbage clothed with very short-rayed stellate pubescence.
  Leaves green above, sparsely stellate-pubescent.
    Inflorescence mostly simple; flower-clusters nearly sessile. 1. *M. fasciculatus.*
    Inflorescence branched; flower-clusters lax. 1*a*. *M. fasciculatus splendidus.*
  Leaves hoary on both surfaces, with a dense soft stellate-pubescence. 2. *M. Nuttallii.*

Calyx and herbage clothed with long-rayed hispid-like stellate pubescence.
  Leaves 6–8 cm. broad, rugose; calyx-tube not obscured by the pubescence; calyx-lobes triangular. 3. *M. Davidsoni.*
  Leaves 2–3 cm. broad; nut rugose; surface of calyx-tube completely hidden by the dense hoary hispid pubescence; calyx-lobes lanceolate-acuminate. 4. *M. orbiculatus.*

1. MALACOTHAMNUS FASCICULATUS (Nutt.) Greene, Leaflets **1**: 208. 1906.

Malva fasciculata Nutt. in Torr. & Gray, Fl. N. Am. **1**: 226. 1838.
Malvastrum fasciculatum Greene, Fl. Fran. 108. 1891.
Malvastrum Thurberi A. Gray, Mem. Am. Acad. II. **5**: 307. 1855.

Type locality: "St. Barbara." Nuttall's specimens are like the form occurring at San Diego, where he probably obtained his specimens, as the species has not since been found at Santa Barbara.

Distribution: The typical form seems to be confined to southwestern San Diego County. Upper and Lower Sonoran.

Specimens examined: "St. Barbara" (?), *Nuttall;* San Diego, *Brandegee* (distributed by *Baker 1626*); *Orcutt*, 1884; *Palmer 25; Abrams 3429;* Chollar Valley, *Susan G. Stokes*, June 15, 1895; Lemon Grove road, *Chandler 5298.*

1*a*. **Malacothamnus fasciculatus splendidus.** (Kell.)

Malvastrum splendidum Kell. Proc. Calif. Acad. **1**: 67. 1855.
Malvastrum Thurberi laxiflorum A. Gray, Proc. Am. Acad. **22**: 291. 1887.

Type locality: Contributed by "Mr. M. A. Wallace of Los Angeles," who probably collected it on the neighboring hills.

Distribution: Santa Monica and San Fernando Mountains, southward to the Santa Ana Mountains and eastward to the San Bernardino Mountains. Upper Sonoran.

Specimens examined: Cahuenga Pass, *Davidson*, May 1, 1892, and April 10, 1900; *Abrams 1246;* Verdugo Hills, *Abrams 1382;* near San Bernardino, *Parish*, June 15, 1898, Laguna, Orange County, *Abrams 1781.*

2. **Malacothamnus Nuttallii** sp. nov.

Shrub, 2–3 meters high; branches erect or ascending, canescent with a short-rayed stellate pubescence; petioles 1.5–2.5 cm. long; leaves acutely 5-lobed, crenate-serrate, slightly or not at all cordate, 2.5–4 cm. long, equally hoary on both surfaces with a close, soft, short-rayed, stellate pubescence; inflorescence loose, compound; bractlets subulate, 2–3 mm. long; calyx 1 cm. long; lobes triangular, acute, equaling the tube; petals rose-purple, twice the length of the calyx; carpels stellate-pubescent on the summit, obovate, 3 mm. high.

This species was first discovered by Nuttall who considered it an undescribed species of *Malva*, but the name proposed by him over seventy years ago has never been published and now is not tenable. I therefore take pleasure in naming this long unrecognized but strikingly distinct species in honor of that acute observer and enthusiastic collector.

Type: Casitas Pass, Ventura County, *Abrams*, July 25, 1908. The type specimen is deposited in the Herbarium of Stanford University.

Distribution: Southern slopes of the Santa Ynez Mountains. Upper Sonoran.

Specimens examined: Foothills of the Santa Ynez Mountains, near Santa Barbara, *Elmer 3730; Franceschi*, Nov. 1909; *Greene*, July, 1886; Casitas Pass, *Abrams*, July 25, 1908.

3. MALACOTHAMNUS DAVIDSONI (Robinson) Greene, Leaflets **1**: 208. 1906.

Malvastrum Davidsoni Robinson, in A. Gray, Syn. Fl. **1**, pt. 1: 312. 1897.

Type locality: The type specimens were collected by Dr. A. Davidson in "San Fernando Valley."

Distribution: Robinson reports this species from Antelope and Bear Valleys as well as from the San Fernando Valley. The Bear Valley specimens cited by him I have not seen, but those from Antelope Valley (*Parish 1955*) belong to the next species. This species is known to me only from San Fernando Valley and the adjoining La Canada. Lower Sonoran.

Specimens examined: San Fernando, *Davidson*, May, 1893, and June 24, 1895; San Fernando wash, *Davidson*, 1907; Big Tejunga wash, *Lyon*, Aug. 1884; La Canada, *Abrams 1401*.

4. MALACOTHAMUS ORBICULATUS Greene, Leaflets **1**: 208. 1906.

Malvastrum orbiculatum Greene, Fl. Fran. 109. 1891.

Type locality: "In the mountains south of Tehachapi, Kern Co."

Distribution: On the desert slopes of the San Bernardino Mountains northward to the Tehachapi Mountains. Upper Sonoran.

Specimens examined: Near Griffens, Lockwood Valley, *Elmer 3895;* between Oakgrove Canyon, and Elizabeth Lake, *Abrams & McGregor 405;* Antelope Valley, *Parish 1955;* north slope of the San Bernardino Mountains, *S. B. & W. F. Parish 139;* Gold Mountain, *Abrams 2070;* Swartout Valley, San Gabriel Mountains, *Abrams & McGregor 631;* Acton, *Davidson,* July 4, 1892; Rock Creek, *Davidson,* July 4, 1893.

In addition to these four mainland species there is a fifth on the islands, **Malacothamnus nesioticus** (Robinson) = *Malvastrum nesioticum* Robinson, in A. Gray, Syn. Fl. **1**, pt. 1: 312. 1897. This species is intermediate between *M. fasciculatus* and *M. Nuttallii,* having the leaf-outline of the latter, but with the upper surface green and nearly glabrous.

3. HIBISCUS. Rose mallow.

1. Hibiscus denudatus Benth. Bot. Sulph. 7, *pl. 3.* 1844.

Type locality: "Bay of Magdalena."

Distribution: Dry gravelly ravines and slopes of the Colorado Desert, extending southward into northern Lower California, and eastward to El Paso. Lower Sonoran.

Specimens examined: Signal Mountain, Colorado Desert, *Abrams 3178,* and Dec. 29, 1907; Palm Springs, *Mrs. Hutchinson,* April, 1910.

STERCULIACEAE. Sterculia Family.

1. FREMONTODENDRON. California slippery elm.

1. Fremontodendron californicum (Torr.) Coville, Cont. Nat. Herb. **4**: 74. 1893.

Fremontia californica Torr. Pl. Frem. 5, *pl. 2.* 1853.
Chiranthodendron californicum Baill. Hist. Pl. **4**: 70. 1873.

Type locality: "Sources of the Sacramento, in the northern part of the Sierra Nevada of California."

Distribution: Western slope of the Sierra Nevada and the more interior parts of the Coast Ranges, from the vicinity of Mt. Shasta south to the Cuiamaca Mountains. Higher altitudes of the Upper Sonoran and the lower parts of the Transition.

Specimens examined: Cuddy's ranch, *Rothrock 278;* San Ysabel, *Henshaw*, May 12, 1893; Lytle Creek Canyon, altitude 1250 meters, *Abrams 2696;* near Elizabeth Lake, *Abrams & McGregor 404;* Soldier's Camp, near Fort Tejon, *Abrams & McGregor 272;* Rock Creek, *Abrams & McGregor 615.*

FRANKENIACEAE. FRANKENIA FAMILY.

1. FRANKENIA. YERBA REUMA.

1. FRANKENIA PALMERI S. Wats. Proc. Am. Acad. **11**: 124. 1876.

Type locality: "Lower California, upon the gulf side."

Distribution: Vicinity of San Diego, southward along the coast of Lower California, and on the adjacent islands. Lower Sonoran.

Specimens examined: National Ranco, near San Diego, *Cleveland*, May 11, 1880; borders of salt marshes, National City, *Pringle*, May 3, 1882; San Diego, *Herre*, Aug. 8, 1902.

Another species, *Frankia grandiflora*, which is a perennial, herbaceous plant, is abundant in low saline ground along the coast.

FOUQUIERACEAE. FOUQUIERA FAMILY.

1. FOUQUIERA. OCOTILLO.

1. FOUQUIERA SPLENDENS Engelm. in Wisliz. Mem.
Tour. North Mex. 98. 1848.

Type locality: "From the Journada del Muerto in New Mexico, to Chihuahua, Saltillo, and Monterey."

Distribution: Desert slopes of the Cuiamaca and San Jacinto Mountains, eastward to western Texas, and south through northern Mexico. Lower Sonoran.

Specimens examined: Near Signal Mountain, *Abrams 3164.*

CISTACEAE. ROCKROSE FAMILY.

1. HELIANTHEMUM. ROCK ROSE.

Petals 4–6 mm. long; calyx-lobes 3–5 mm. long in flower.	1. *H. scoparium.*
Petals 8–13 mm. long; calyx-lobes 6–7 mm. long in flower.	2. *H. Aldersoni.*

1. Heliantheмum scoparium Nutt.; Torr. & Gray, Fl. N. Am. **1**: 152. 1838.

Type locality: "Dry hills around Monterey, California."

Distribution: Northern California, southward to the vicinity of Los Angeles. Upper Sonoran.

Specimens examined: Bushy hillsides, near Los Angeles, *Hasse*, June 5, 1888; near Monrovia, *Dudley*, Dec. 16, 1907; Etiwanda, *Abrams 2664;* Lytle Creek Canyon, *Hall 1409*.

2. Helianthemum Aldersoni Greene, Erythea **1**: 259. 1893.

Type locality: "Mountains of the southern border of San Diego Co. Calif. among rocks in hard and sterile granitic soil."

Distribution: Foothills on the coastal slope of the San Bernardino Mountains, southward to Lower California. Upper and Lower Sonoran.

This is perhaps best considered as a geographical variation of the former. It differs chiefly in being taller and having larger floral parts, characters that do not seem constant.

Specimens examined: Vicinity of San Bernardino, *Parish 4837;* foothills near San Bernardino, *Parish*, June 15, 1898; Dulzura, *Abrams 3749;* Potrero, *Susan G. Stokes*, July 19, 1895.

CACTACEAE. Cactus Family.

Leaves present, but early deciduous, subulate; spines straight, sheathed; glochids present, retrorsely barbed and easily detached; stems conspicuously jointed. 1. *Opuntia.*

Leaves absent; spines hooked or straight, never sheathed; glochids always wanting; stems not jointed or if so not conspicuously; flowers borne on more or less vertical ribs.
  Flowers nearly vertical arising from young areolae. 2. *Echinocactus.*
  Flowers lateral, arising just above fully developed spine-bearing areolae.
    Ovary scaly, nearly or quite destitute of spines; tall, columnar, tree-like plants. 3. *Carnegiea.*
    Ovary and fruit spiny; stems slender-cylindric; flowers greenish-yellow; seeds not tuberculate. 4. *Bergerocactus.*

Only the larger or taller cacti which, on account of their size, have the appearance of shrubs, are included in this list.

1. OPUNTIA. Prickly pear.

Joints of the stems not flattened, cylindrical (except no. 4); spines sheathed.
  Stems very slender; spines usually solitary in the areoles. 1. *O. ramosissima.*
  Stems stout; spines several in each areole.

Fruit fleshy, sparsely or not at all spiny; flowers deep red.

Branches widely spreading; spine-sheaths yellowish or rusty. 2. *O. prolifera.*

Branches erect or ascending, forming close compact cluster above, at length becoming reflexed; sheath-spines bright-whitish. 3. *O. Bigelovii.*

Fruit dry and very spiny; flowers yellow or copper color.

Stems erect, with few alternate branches; spines very slender; flowers copper color. 4. *O. acanthocarpa.*

Stems diffusely branching; flowers yellow.

Joints ovate-clavate; fruit densely spiny. 5. *O. echinocarpa.*

Joints cylindrical.

Stems usually prostrate; areoles of ovary bearing several spines. 6. *O. californica.*

Stems erect and bushy; areoles of ovary bearing a single spine. 7. *O. bernardina.*

Joints of the stem flattened, narrowly obovate to suborbicular; spines not sheathed.

Fruit dry and spiny. 8. *O. hystricina.*

Fruit fleshy.

Spines brownish.

Flowers yellow. 9. *O. Covillei.*

Flowers magenta. 10. *O. magenta.*

Spines yellow.

Old trunks very spiny; seeds 2.5–3.5 mm. broad. 11. *O. chlorotica.*

Old trunks becoming spineless; seeds 5–6 mm. broad.

Areoles 35–50 mm. apart. 12. *O. occidentalis.*

Areoles 25 mm. apart. 13. *O. littoralis.*

1. OPUNTIA RAMOSISSIMA Engelm. Am. Journ. Sci. II. **14**: 339. 1852.

Opuntia tessellata Engelm. Proc. Am. Acad. **3**: 309. 1856.

Type locality: "Gravelly soil near the Colorado, and in the desert." Collected by Dr. Parry on an expedition "from the sea-coast (San Diego) to the mouth of the Gila."

Distribution: Southern Nevada, southward to Sonora, and westward to the Mohave and Colorado Deserts. Lower Sonoran.

Specimens examined: Yuma, *Toumey;* Colorado Desert, *Sykes.*

2. OPUNTIA PROLIFERA Engelm. Am. Journ. Sci. II. **14**: 338. 1852.

Type locality: "San Diego, on arid hills and in dry creek beds."

Distribution: A maritime species extending from the vicinity of San Pedro southward to San Diego, and probably into northern Lower California. Upper and Lower Sonoran.

Specimens examined: Mission Hills, San Diego, *Abrams 3394.*

3. Opuntia Bigelovii Engelm. Pacif. R. Rep. **4**: 50. 1856.

Distribution: Southern Nevada and Arizona, southward to the western slopes of the Colorado Desert. Lower Sonoran.

Specimens examined: Whitewater, *Rose*, 1908.

4. Opuntia acanthocarpa Engelm. & Bigel. Proc. Am. Acad. **3**: 308. 1856.

Type locality: "Mountains of Cactus Pass, between Santa Fe and the Western Colorado."

Distribution: Southern Utah and Nevada, southward through Arizona. Reported from Death Valley by Schumann. Lower Sonoran.

Specimens examined: near Campo, *Sykes;* Mammoth Tank, *Sykes.*

5. Opuntia echinocarpa Engelm. & Bigel. Proc. Am. Acad. **3**: 305. 1856.

Type locality: "In the valley of the Lower Colorado."

Distribution: Western Arizona, westward through the Mohave and Colorado Deserts, and southward into Sonora and Lower California. Lower Sonoran.

Specimens examined: Palm Springs, *Dudley*, Dec. 1902; Rock Creek, desert slope of the San Gabriel Mountains, *Abrams & McGregor 564;* Banning, *Toumey*, 1895; Barstow, *Shaller.*

6. Opuntia californica (Nutt.) Coville, Proc. Biol. Soc. Wash. **13**: 119. 1899.

Opuntia serpentina Engelm. Am. Journ. Sci. II. **14**: 338. 1852.

Cereus californica Nutt. in Torr. & Gray, Fl. N. Am. **1**: 555. 1840.

Type locality: "Arid hills and denuded tracts near St. Diego, California, common."

Distribution: Dry mesas and foothills of southwestern San Diego County, southward into Lower California. Lower Sonoran.

Specimens examined: Tia Juana, *Abrams 3474.*

7. Opuntia bernardina Engelm.; Parish, Bull. Torrey Club **19**: 92. 1892.

Type locality: "Dry hills and mesas from the Coast Range to the San Bernardino Mts., in the San Jacinto and San Bernardino Valleys."

Distribution: A characteristic plant of the interior valleys of southern California. It occurs in the vicinity of Newhall, in the San Fernando Valley, and is common in the San Bernardino and San Jacinto Valleys. Lower Sonoran.

Specimens examined: Cajon Pass, *Abrams & McGregor 699;* Elsinore, *Abrams*, July, 1908; Warner's Ranch, *Schaller;* Pala, *Schaller.*

8. Opuntia hystricina Engelm. & Bigel. Pacif. R. Rep. **4**: 44, *pl. 15, f. 5–7.* 1856.

Type locality: "At the Colorado Chiquito and on the San Francisco mountains."

Distribution: Western Texas, westward to southern Nevada, and Owen's Valley, California, according to Schumann. I have seen no specimens within our limits. Lower Sonoran.

9. Opuntia Covillei Britton & Rose, Smiths. Miscel. Coll. **50**: 532. 1908.

Type locality: "San Bernardino, California."

Distribution: On the gravelly footslopes in the San Bernardino and San Jacinto Valleys, and occasionally along the desert bases of the San Gabriel Mountains. Lower Sonoran.

Specimens examined: Rock Creek, desert slope of the San Gabriel Mountains, *Abrams & McGregor 558.*

10. Opuntia magenta Griffiths, Rep. Mo. Bot. Gard. **19**: 268. 1908.

Type locality: "Near Redlands, California."

Distribution: This species seems to be confined to the foothills and footslopes around the San Bernardino Valley. I have not seen any specimens. Lower Sonoran.

11. Opuntia chlorotica Engelm. & Bigel. Proc. Am. Acad. **3**: 291. 1856.

Type locality: "Western Colorado Country, between New Mexico and California, from the San Francisco Mountains to Mohave Creek."

Distribution: New Mexico, westward through Arizona and southern Nevada to the Mohave Desert, and southward to Sonora. I have not seen any southern California specimens. Lower Sonoran.

12. Opuntia occidentalis Engelm. & Bigel. Proc. Am. Acad. **3**: 291. 1856.

Opuntia Engelmanni occidentalis Engelm. in Bot. Calif. **1**: 248. 1876.

Opuntia Lindheimeri occidentalis Coult. Contr. Nat. Herb. **3**: 421. 1896.

Type locality: "On the western slope of the California mountains, near San Diego and Los Angeles."

Distribution: The common prickly pear of the coast slope of southern California, often growing in dense thickets of considerable area. Upper and Lower Sonoran.

Specimens examined: Los Angeles, *Hasse 6169;* near Pasadena, *MacDougal*, 1906; Mesa Grande, *Schaller;* Pala, *Schaller.*

13. Opuntia littoralis (Engelm.) Britton & Rose, Smiths. Miscel. Coll. **50**: 529. 1908.

Opuntia Engelmanni littoralis Engelm. in Bot. Calif. **1**: 248. 1876.

Opuntia Lindheimeri littoralis Coult. Contr. Nat. Herb. **3**: 422. 1896.

Type locality: "On the coast from Santa Barbara and the islands in its gulf to San Diego, and southward."

Distribution: Bluffs along the seashore of southern California, and on the islands off the coast. Upper Sonoran.

Specimens examined: Playa del Rey, *Abrams 2515.*

3. ECHINOCACTUS.

Stems simple, large, globose to cylindrical ("barrel-cactus"); ovary scales ovate orbicular; fruit not woolly.

Central spine 1; flowers purple. 1. *E. Emoryi.*

Central spines 4; flowers greenish-yellow.
  Radial spines all stout and annulated. 2. *E. cylindraceus.*
  Radial spines of 2 kinds; the lateral slender and flexuous, the dorsal and ventral slightly ribbed. 3. *E. Lecontei.*
Stems numerous, often growing in mats; ovary-scales subulate; fruit densely woolly. 4. *E. polycephalus.*

1. ECHINOCACTUS EMORYI Engelm. in Emory, Notes Mil. Reconnois. 157. 1848.

Type locality: "Oct. 25, 1846." According to Emory's notes he was on the Gila River in the vicinity of San Carlos Creek on this date.

Distribution: Central and western Arizona, southward into Sonora and Lower California, and westward into southern California. This species was reported from the "Mohave region" in the Botany of California, but it is not certain that Bigelow's specimens were collected on the California side of the Colorado River. The species is to be expected, however, along the eastern border of the Mohave Desert and southward along the eastern borders of the State. Lower Sonoran.

2. ECHINOCACTUS CYLINDRACEUS Engelm. Pacif. R. Rep. **4**: 32. 1856.

Echinocactus viridescens cylindraceus Engelm. Am. Journ. Sci. II. **14**: 338. 1852.

Type locality: "Near San Felipe, on the eastern slope of the California mountains."

Distribution: Gravelly slopes and washes along the western border of the Colorado Desert. Lower Sonoran.

Specimens examined: Whitewater, *Rose*, 1908.

3. ECHINOCACTUS LECONTEI Engelm. Pac. R. Rep. **4**: 29. 1856.

Echinocactus Wislizeni Lecontei Engelm. U. S. Geog. Surv. **6**: 128. 1878.

Type locality: "First noticed by Dr. John L. LeConte, on the lower Gila."

Distribution: Southwestern Utah, westward to the eastern borders of southern California, and southward through western Arizona to Sonora. This species was observed by Bigelow "at the head waters of Williams River, down this stream to the Colorado, and west of it till *E. polycephalus* took its place." Coville and Funston also report it from Surprise Canyon, in the Panamint Mountains. Lower Sonoran.

4. ECHINOCACTUS POLYCEPHALUS Engelm. Pac. R. Rep. **4**: 31. 1856.

Type locality: "Stoney and gravelly hills and dry beds of torrents from 20 miles west of the Rio Colorado to about 150 miles westward up the Mohave."

Distribution: From the vicinity of Victor, northward to the Inyo Mountains, and eastward to southwestern Utah and western Arizona. Lower Sonoran.

Specimens examined: Barstow, *Rose*, 1908.

4. CARNEGIEA. GIANT CACTUS.

1. CARNEGIEA GIGANTEA (Engelm.) Britton & Rose, Journ. N. Y. Bot. Gard. **9**: 187. 1908.

Cereus giganteus Engelm. in Emory, Notes Mil. Reconnois. 159. 1848.
Pilocereus Engelmannii Lem. Ill. Hortic. **9**: Misc. 97. 1862.
Pilocereus giganteus Haage & Schmidt, Cat. 230. 1898.

Type locality: "Along the Gila River, about the middle of its course."

Distribution: The Giant cactus occurs through the southern part of Arizona and northern Sonora, and, according to Dr. D. T. MacDougal, it extends across the Colorado River into the borders of southern California in the vicinity of Ehrenburg. Lower Sonoran.

5. BERGEROCACTUS.

1. BERGEROCACTUS EMORYI (Engelm.) Britton & Rose, Contr. Nat. Herb. **12**: 474. 1909.

Cereus Emoryi Engelm. Am. Jour. Sci. II. **14**: 338. 1852.

Type locality: "In thick patches, on dry hills near the sea shore about the boundary line," near San Diego, California.

Distribution: Vicinity of San Diego, southward into Lower California. Lower Sonoran.

Specimens examined: Tia Juana, *Abrams 3473*.

CORNACEAE. Dogwood Family.

Flowers in aments, dioecious; stigmas lateral. 1. *Garrya.*
Flowers not in aments, perfect; stigmas terminal.
  Flowers cymose, not subtended by an involucre. 2. *Svida.*
  Flowers capitate, subtended by a large petaloid involucre. 3. *Cynoxylon.*

1. GARRYA. Silk-tassel tree.

Pubescence on lower surface of leaves of tangled or matted hairs.
1. *G. Veatchii Palmeri.*
Pubescence on lower surface of leaves of upwardly appressed hairs.
2. *G. pallida.*

1. Garrya Veatchii Palmeri (S. Wats.) Eastwood, Bot. Gaz. **36**: 458. 1903.

Garrya flavescens Palmeri S. Wats. Bot. Gaz. **1**: 276. 1876.
Garrya Veatchii undulata Eastwood, Bot. Gaz. **36**: 458. 1903.

Type locality: "Milquatay, 60 miles from San Diego, on the Fort Yuma Road."

Distribution: In the chaparral belt of the mountains from Ventura County south to northern Lower California. Upper Sonoran.

Specimens examined: La Cumbre trail, Santa Ynez Mountains, *Abrams 4308;* Switzer's trail, San Gabriel Mountains, *Grinnell 16;* Arroyo Seco Caynon, San Gabriel Mountains, *Grinnell 40;* Sisar Canyon, Topatopa Mountains, *Abrams & McGregor 64;* Lytle Creek Canyon, *Abrams 2805;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 671.*

2. Garrya pallida Eastwood, Proc. Calif. Acad. III. **2**: 287. 1902.

Type locality: "Kings River Canyon," Kern County, California.

Distribution: Southern Sierra Nevada south to the Cuiamaca Mountains. Upper Sonoran and lower altitudes of the Transition.

Specimens examined: Buckhorn Tavern, near Fort Tejon, *Abrams & McGregor 283;* La Cumbre Peak, Santa Ynez Mountains, *Abrams 4318;* Topatopa Mountains, *Abrams & McGregor 104;* Rock Creek, *Abrams & McGregor 568;* Cold Creek, San Bernardino Mountains, *Abrams & McGregor 814;* Mount Santiago, *Abrams 1811;* Middle Peak, Cuiamaca Mountains, *Abrams 3872.*

2. SVIDA. Dogwood.

1. **Svida californica** (C. A. Mey.)

Cornus californica C. A. Mey. Bull. Phys.-Math. Acad. Petersb. **3**: 372. 1845.

Cornus sericea occidentalis Torr. & Gray, Fl. N. Am. **1**: 652. 1840.

Cornus pubescens californica Coulter & Evans, Bot. Gaz. **15**: 37. 1890.

Cornus occidentalis Coville, Cont. Nat. Herb. **4**: 117. 1893.

Type locality: "Hab. in litore occidentali Americae septentrionalis (Hooker), in California prope St. Francisco! (Cham.) et prope coloniam Ross!"

Distribution: Southern British Columbia and western Idaho, south to southern California. Upper Sonoran and Transition.

Specimens examined: Oak Knoll, Pasadena, *Grant 217;* Swartout Canyon, San Gabriel Mountains, *Abrams & McGregor 653;* near Strawberry Peak, San Bernardino Mountains, altitude 1800 meters, *Abrams 2009;* western slope of San Jacinto Mountain, altitude 1800 meters, *Hall 2233;* Cuiamaca Mountains, *Palmer 46;* Palomar Mountain, *Parish 4465;* Grass Valley, San Bernardino Mountains, *Parish 3105.*

3. CYNOXYLON. Flowering Dogwood.

1. Cynoxylon Nuttallii (Audubon) Shafer, in Britton, N. Am. Trees 746. 1908.

Cornus Nuttallii Audubon; Torr. & Gray, Fl. N. Am. **1**: 652. 1840.

Type locality: "Oregon."

Distribution: British Columbia and northern Idaho, extending southward to the mountains of southern California. Transition.

Specimens examined: Near Strawberry Peak, San Bernardino Mountains, altitude 1800 meters, *Abrams 2016.*

ERICACEAE. Heath Family.

Fruit capsular; anthers not appendaged.
  Bracts thin, deciduous; leaf-buds scaly; leaves not heath-like. 1. *Azalea.*
  Bracts firm, persistent; no scaly buds; leaves heath-like. 2. *Phyllodoce.*

Fruit a berry or berry-like drupe; anthers with dorsal, reflexed appendages; corolla urn-shaped.
  Ovary 5-celled; ovules several to each cell. 3. *Arbutus.*
  Ovary 5–10 celled; ovules 1 to each cell.
    Ovary rugose or granular. 4. *Comarostaphylis.*
    Ovary not rugose or granular.
      Leaves dark green and glabrous above, tomentose beneath, not vertical. 5. *Xylococcus.*
      Leaves similar on both surfaces, often vertical. 6. *Uva-ursi.*

1. AZALEA. AZALEA.

1. AZALEA OCCIDENTALIS Torr. & Gray, Pacif. R. Rep. **4**: 116. 1857.

Rhododendron occidentale A. Gray, Bot. Calif. **1**: 458. 1876.

Type locality: "Laguna de Santa Rosa, in low and wet ravines."

Distribution: Coast Ranges and Sierra Nevada, southward to the Cuiamaca Mountains in San Diego County. Transition.

Specimens examined: San Jacinto Mountains, in canyons on the west side, at 1800 meters, *Hall 2241;* Cuiamaca Mountains, altitude 1500 meters, *Susan G. Stokes*, July, 1895; *Abrams 3953.*

2. PHYLLODOCE.

1. PHYLLODOCE BREWERI (A. Gray) Heller, Muhlenbergia **1**: 1. 1900.

Bryanthus Breweri A. Gray, Proc. Am. Acad. **7**: 367. 1868.

Type locality: Of the several specimens cited, the first, which was collected by Brewer, was from "Woods Peak, Eldorado Co.," California.

Distribution: Southern Cascade Mountains, southward through the higher altitudes of the Sierra Nevada to Mount San Gorgonio, San Bernardino Mountains. Canadian Zone.

Specimens examined: Mount San Gorgonio, *Abrams & McGregor 750.*

3. ARBUTUS. MADROÑO.

1. ARBUTUS MENZIESII Pursh, Fl. Am. Sept. **1**: 282. 1814.

Type locality: "On the north-west coast of America."

Distribution: British Columbia, southward to the San Gabriel Mountains in southern California. Transition and extending into the Upper Sonoran.

Specimens examined: Mt. Wilson trail, altitude 1000 meters, *Abrams 1515.*

4. COMAROSTAPHYLIS.

1. **Comarostaphylis diversifolia** (Parry) Greene, Bull. Calif. Acad. 2: 406. 1887.

Arctostaphylos arguta diversifolia Parry, Proc. Davenp. Acad. **4**: 35. 1884.

Arctostaphylos diversifolia Parry; A. Gray, Syn. Fl. **2**, ed. 2, pt. 1: 397. 1886.

Type locality: "In Jamul Valley." The first of several localities mentioned, and the only one from which flowering specimens were obtained.

Distribution: Santa Monica Mountains, southward to northern Lower California, and on the islands off the coast, as far northward as Santa Cruz Island. Upper and Lower Sonoran.

Specimens examined: Santa Cruz Island, *Grinnell*, Sept. 3, 1903; Topango Canyon, Santa Monica Mountains, *Hasse*, July 14, 1906.

5. XYLOCOCCUS.

1. **Xylococcus bicolor** Nutt. Trans. Am. Phil. Soc. II. **8**: 259. 1843.

Comarostaphylis bicolor Klotzsch, Linnaea **24**: 78. 1851.
Arctostaphylos bicolor A. Gray, Proc. Am. Acad. **7**: 366. 1867.
Arctostaphylos Clevelandi A. Gray, Syn. Fl. **2**, pt. 1: 29. 1878.

Type locality: "Hab. Monterey, Upper California." This is probably an error for the species is not known in the Monterey region. Nuttall's specimens no doubt came from San Diego.

Distribution: In the chaparral on the mesas and foothills of western San Diego County, southward to northern Lower California, also on the islands off the coast. Upper and Lower Sonoran.

Specimens examined: Cottonwood Grade, near Potrero, *Abrams 3729.*

6. UVA-URSI. MANZANITA OR BEARBERRY.

Pedicels and ovaries glabrous.
  Stone solid, broadly ellipsoid, merely angled or ribbed; branchlets, inflorescence and young leaves canescent. 1. *U. Parryana.*
  Stone lobed, depressed-globose, irregularly separable into nutlets.
    Branchlets, inflorescence and young leaves canescent; leaves becoming dull-green. 2. *U. pungens.*

Branchlets and inflorescence with a golden resinous undument, or glandular pubescent; leaves bright yellowish-green.
3. *U. patula.*

Pedicels more or less pubescent or villous; ovaries pubescent or viscid.

Bracts firm, herbaceous or foliaceous; sepals ciliate on the margins, otherwise glabrous or puberulent.

Fruit ovoid, very viscid; stone solid, slightly ribbed; leaves very glaucous; branchlets glabrous or sometimes glandular-villous.
4. *U. glauca.*

Fruit depressed-globose, pubescent, not viscid; stone lobed and separable into irregular nutlets; pubescence of herbage variable.
5. *U. tomentosa.*

Bracts thin and scarious; sepals and herbage glandular-villous; stone solid, ovoid. 6. *U. drupacea.*

Dr. F. N. Williams (Journ. Bot. **48**: 183, 184. 1910) has shown that *Uva-ursi* (Tourn.) Miller (Gard. Dict. **3**. 1754) has priority over *Arctostaphylos* Adans. (Fam. **2**: 163. 1763) and should replace it, according to the Vienna Rules.

1. **Uva-ursi Parryana** (Lemmon)

Arctostaphylos Parryana Lemmon, Pittonia **2**: 68. 1890.

Type locality: "On the Tehachapi Mountains of south-central California, four miles west of Keene Station."

Distribution: Tehachapi Mountains and Mount Pinos, southward to Mount San Antonio. Transition and Upper Sonoran.

Specimens examined: Mount Pinos, altitude 2100 meters, *Abrams & McGregor 261; Elmer 3980;* Soldiers' Camp, near Fort Tejon, *Abrams & McGregor 281;* Coldwater Canyon, Mount San Antonio, altitude 2250 meters, *Abrams 2716.*

2. **Uva-ursi pungens** (H.B.K.).

Arctostaphylos pungens H.B.K. Nov. Gen. & Sp. **3**: 278, *pl. 259.* 1818.

Daphnidostaphylos pungens Klotzsch, Linnaea **24**: 80. 1851.

Type locality: "Crescit in Regio Mexicano, locis alsis, juxta Moran et Villalpando, alt. 1300–1400 hex."

Distribution: Southern California, southward to the mountains of Lower California and central Mexico. Upper Sonoran.

Specimens examined: Near Clark's ranch, San Bernardino Mountains, altitude 1500 meters, *Abrams 2936;* between Campo and Jacumba Hot Spring, *Abrams 3624;* Pine Valley, San Diego

County, *Mearns 3980;* West Fork of Deep Creek, San Bernardino Mountains, *Abrams & McGregor 721.*

3. **Uva-ursi patula** (Greene)

Arctostaphylos patula Greene, Pittonia **2**: 171. 1891.

Type locality: "The common manzanita of dry rocky ridges in pine woods of middle altitudes in the Sierra Nevada, California, from Calaveras Co. southward to Fresno."

Distribution: Southern Cascade Mountains, southward to the San Jacinto Mountains. Transition.

Specimens examined: Strawberry Peak, San Bernardino Mountains, *Abrams 2019;* Tahquitz Valley, San Jacinto Mountains, altitude 2400 meters, *Hall 2419* (in part); between Dollar Lake and Hathaway Flat, San Bernardino Mountains, *Abrams & McGregor 804.*

4. **Uva-ursi glauca** (Lindl.)

Arctostaphylos glauca Lindl. Bot. Reg. **21**: sub *pl. 1791.* 1836.

Type locality: "California, *Douglas*."

Distribution: Central California, southward to the southern boundary of the State. Upper Sonoran.

Specimens examined: Santa Ynez Mountains, *Elmer 3967;* Arroyo Seco Canyon, San Gabriel Mountains, *Grinnell 32, 37;* Mount Wilson trail, altitude 900 meters, *Abrams 1501;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 156;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 670.*

5. **Uva-ursi tomentosa** (Pursh)

Arbutus tomentosa Pursh, Fl. Am. Sept. **1**: 282. 1814.

Arctostaphylos tomentosa Dougl. Bot. Reg. **21**: *pl. 7911.* 1836.

Xerobotrys tomentosus Nutt. Trans. Am. Phil. Soc. II. **8**: 268. 1843.

Type locality: "On the north-west coast of America."

Distribution: Southern British Columbia, southward to northern Lower California. In southern California this species grows in the higher altitudes of the Upper Sonoran and sometimes extends into the lower part of the Transition. There is great variation, especially in pubescence, and several well-marked forms seem to occupy distinct geographic areas. In the coastal mountains the plants are usually setose-hispid and glandular-pubescent or glandular-villous. They are very much like Menzies' original specimens, and perhaps are also identical with *A. glandulosa* Eastw. The specimens I have cited from the Topatopa, the Liebre, and the San Bernardino Mountains are not at all glandular and are almost or entirely without setose hairs. The leaves are comparatively bright green, being only sparsely tomentose. In the Cuiamaca Mountains, on the other hand, the plants have very pale foliage, which is more or less permanently canescent. The branches are without setose hairs, but are either canescent or glandular-pubescent.

Specimens examined: Santa Ynez Mountains, *Elmer 3798;* Mount Wilson trail, altitude 600 meters, *Abrams 1500;* Topatopa Mountains, *Abrams & McGregor 84;* Liebre Mountain, *Abrams & McGregor 370;* Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 705;* Mount Wilson trail, altitude 1000 meters, *Abrams 1520;* Los Tunas Canyon, Santa Monica Mountains, *Abrams 1699;* Silverado Canyon, Santa Ana Mountains, *Helen D. Geis 723;* between Julian and Banner, *Abrams 3973;* hills near Campo, *Abrams 3620.*

6. **Uva-ursi drupacea** (Parry)

Arctostaphylos Pringlei drupacea Parry, Bull. Calif. Acad. **2**: 494. 1887.

Type locality: "Mountains east of San Diego."

Distribution: San Bernardino Mountains, southward to northern Lower California. Transition.

Specimens examined: Mill Creek Falls, 1600 meters, *Parish 5070;* Strawberry Peak, San Bernardino Mountains, *Abrams,* July 28, 1901; *Abrams & McGregor 726;* San Jacinto Mountains, altitude 1400 meters, *Hall 2092;* summit of Cuiamaca Mountain, *Abrams 3947;* Cold Creek, San Bernardino Mountains, *Abrams & McGregor 815.*

STYRACACEAE. STYRAX FAMILY.

1. STYRAX. STORAX.

1. STYRAX CALIFORNICUM FULVESCENS Eastw. Bot. Gaz. **41**: 286. 1906.

Type locality: "Near the Painted cave in the Santa Ynez Mountains back of Santa Barbara, California."

Distribution: Santa Ynez Mountains and San Bernardino Mountains, in the upper portion of the chaparral belt. Upper Sonoran.

Specimens examined: Near Santa Barbara, *Bolander*, 1873; Santa Ynez Mountains, *Brandegee*, 1888; foothills of the San Bernardino Mountains, *Clare E. Cummings*, May 1, 1896; foothills near San Bernardino, altitude 1800 meters, *Wright 216;* San Bernardino Mountains, altitude 800 meters, *Leiberg 3324; Vasey 361;* Waterman Canyon, *Shaw & Illingsworth 14.*

OLEACEAE. OLIVE FAMILY.

Fruit a samara; leaves usually pinnate. 1. *Fraxinus.*
Fruit not a samara; leaves entire.
Fruit a 2-parted membranous capsule; corolla yellow; low shrub. 2. *Menodora.*
Fruit a drupe; corolla none; arborescent shrub. 3. *Adelia.*

1. FRAXINUS. ASH.

Leaflets several.
Petals 2; leaflets rounded or obtuse at apex, 2–3 cm. long. 1. *F. dipetala.*
Petals none; leaflets acute or acuminate.
Body of the fruit equaling the wing in length; lateral leaflets sessile. 2. *F. oregona.*
Body of the fruit scarcely over half the length of the wing.
Leaves usually glabrous; lateral leaflets stalked. 3. *F. coriacea.*
Leaves tomentose-pubescent; lateral leaflets sessile. 4. *F. velutina.*
Leaflets only 1 or occasionally 3. 5. *F. anomala.*

1. FRAXINUS DIPETALA Hook. & Arn. Bot. Beech. 362, *pl. 87.* 1840.

Type locality: California, *Douglas.*

Distribution: Coast Ranges and foothills of the Sierra Nevada, south to southern California, where it is most frequent in the interior mountains. Upper Sonoran.

Specimen sexamined: Santa Ynez Mountains, *Elmer 3822;* Mill Creek, San Bernardino Mountains, *Parish 5053; Abrams & McGregor 821;* Sespe Creek, near Ten Sycamore Flat, *Abrams & McGregor 175;* Sulphur Mountain, *Abrams & McGregor 37;* Potrero Hills, near San Jacinto, *S. B. & W. F. Parish 278;* City Creek Canyon, San Bernardino Mountains, altitude 600 meters, *Leiberg 3301.*

2. **Fraxinus oregona** Nutt. Sylva N. Am. **3**: 59. 1849.

Fraxinus americana oregona Wesmael, Bull. Soc. Bot. Belg. **30**: 110. 1892.

Type locality: "This is the only species of Ash we met with in the Oregon territory. . . . We never saw it above the falls of the Oregon."

Distribution: Puget Sound, southward through western Washington and Oregon to southern California. Upper Sonoran and Transition.

Specimens examined: San Gabriel River Canyon, *Abrams 876.*

3. **Fraxinus coriacea** S. Wats. Am. Nat. **7**: 30. 1873.

Type locality: "Ash Meadows, Nevada, and Devil's Run Canyon, Arizona."

Distribution: Southern Utah and Nevada to northern Arizona, and from the vicinity of Owen's Lake southward in the San Gabriel and San Bernardino Mountains, California. Upper Sonoran.

Specimens examined: Lytle Creek Canyon, altitude 800 meters, *Abrams 2741;* Liebre Mountains, *Abrams & McGregor 400;* Cajon Pass, *Abrams & McGregor 692;* Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 703.* (These specimens have narrower leaflets and much broader samaras than typical *coriacea*, and, on more extensive examination of material, may prove to be distinct.)

4. **Fraxinus velutina** Torr. in Emory, Notes Mil. Reconnois. 149. 1848.

Type locality: "In the region between the waters of the Del Norte and Gila; also on the Mimbres, a tributary of the latter river."

Distribution: Southern New Mexico and Arizona to southern California. Upper Sonoran.

Specimens examined: Between Campo and Jacumba Hot Spring, *Abrams 3705;* near Toro Mountain, altitude 1300 meters, *Leiberg 3167.*

5. **Fraxinus amomala** Torr.; S. Wats. Bot. King's Exped. 283. 1874.

Type locality: "In Labyrinth Canyon on the Colorado River, Utah," and "St. George on the Rio Virgen in the southwestern portion of the State."

Distribution: Southwestern Colorado, southern Utah and Nevada, southward to northern Arizona, and the Providence Mountains in southern California. Upper Sonoran.

Specimens examined: Providence Mountains, *Brandegee*, 1902.

2. MENODORA.

Shrubby, 6–10 dm. high, spinescent; herbage puberulent; corolla-lobes oblong, 3 mm. long. 1. *M. spinescens.*

Woody only at base, 3–4 dm. high, not spinescent; herbage glabrous; corolla-lobes ovate, 6–8 mm. long. 2. *M. scoparia.*

1. **Menodora spinescens** A. Gray, Proc. Am. Acad. **7**: 388. 1867.

Type locality: "Canyons and hillsides of the southwestern part of the State of Nevada."

Distribution: Southern Nevada westward to Inyo County, California, and southward to the Providence Mountains. Lower Sonoran.

Specimens examined: Providence Mountains, *Cooper*, May 29, 1861.

2. **Menodora scoparia** Engelm.; A. Gray, Bot. Calif. **1**: 471. 1876.

Menodora scabra glabrescens A. Gray, U. S. Geog. Surv. **6**: 15. 1878.

Type locality: "Saltillo, Mexico."

Distribution: Northern Mexico and western Texas westward to the desert slopes of the southern California mountains. Lower Sonoran.

Specimens examined: Dry gravelly hills, Jacumba Hot Spring, *Abrams 3641.*

3. ADELIA.

1. **Adelia neo-mexicana** (A. Gray) Kuntze, Rev. Gen. Pl. **2**: 410. 1891.

Forestiera neo-mexicana A. Gray, Proc. Am. Acad. **12**: 63. 1876.

Forestiera acuminata parvifolia A. Gray, Proc. Am. Acad. **4**: 364. 1859.

Adelia parvifolia Coville, Contr. Nat. Herb. **4**: 148. 1893.

Type locality: "New Mexico; near Santa Fe, *Fendler*, no. 547. Below El Paso, *Wright*, no. 1699. Semelenque Springs, *Dr. Bigelow*."

Distribution: Western Texas and southern Colorado westward to the western extremities of the Mohave Desert in southern California. Upper and Lower Sonoran.

Specimens examined: Willow Springs, Antelope Valley, *Abrams & McGregor 425;* Rock Creek, east slope of the San Gabriel Mountains, altitude 1350 meters, *Abrams & McGregor 566.*

POLEMONIACEAE. Phlox Family.

1. LEPTODACTYLON.

Corolla salverform, 2.5–3 cm. long.
  Herbage not glandular-pubescent. 1. *L. californicum.*
  Herbage glandular-pubescent. 1*a*. *L. californicum glandulosum.*
Corolla funnelform, 1.5–2 cm. long.
  Herbage glandular-pubescent; leaves alternate. 2. *L. Hookeri.*
  Herbage not glandular-pubescent; leaves opposite. 3. *L. Hallii.*

1. Leptodactylon californicum Hook. & Arn. Bot. Beech. 369. 1840.

Gilia californica Benth. in DC. Prod. **9**: 316. 1845.

Type locality: California. Collected by Douglas probably near Monterey or Santa Barbara.

Distribution: In chaparral of the coast mountains from Santa Barbara northward to Monterey. Upper Sonoran.

Specimens examined: Santa Barbara, *Brandegee*, no date.

1*a*. **Leptodactylon californicum glandulosum** (Eastw.).

Gilia californica glandulosa Eastw. Bot. Gaz. **37**: 447. 1904.

Type locality: "The common form growing around Pasadena, California."

Distribution: In the chaparral belt of the mountains of southern California. Upper Sonoran.

Specimens examined: Near Pasadena, *Jones 3209;* La Canada, *Forbes*, May 2, 1902; Little Santa Anita Canyon, San Gabriel Mountains, *Abrams 2624;* Santa Ana Canyon, near Yorba, *Helen D. Geis*, April, 1902; Lytle Creek Canyon, altitude 600 meters, *Hall 1413.*

2. LEPTODACTYLON HOOKERI (Dougl.) Nutt. Journ. Acad. Philad. II. **1**: 157. 1847.

Phlox Hookeri Dougl.; Hook. Fl. Bor. Am. **2**: 73. *pl. 159.* 1838.
Gilia Hookeri Benth. in DC. Prod. **9**: 316. 1845.
Gilia pungens Hookeri A. Gray, Proc. Am. Acad. **8**: 268. 1870.
Gilia pungens eupungens var. *Hookeri* Brand. Pflanzenreich **4**, Fam. 250: 126. 1907.

Type locality: "Hab. common on arid, sandy and rocky soils near the narrows of the Oakangen and Priest's Rapids of the Columbia."

Distribution: Southern British Columbia, southward through Washington and Oregon to southern California. Transition.

Specimens examined: Mount Pinos, *Elmer 3744;* near Green Valley, San Bernardino Mountains, *Hall 1064;* Bear Valley, *Parish 3683;* Snow Canyon, San Bernardino Mountains, *Parish 5059.*

3. LEPTODACTYLON HALLII (Parish) Heller, Muhlenbergia **1**: 146. 1906.

Gilia Hallii Parish, Erythea **7**: 94. 1899.
Gilia pungens Hallii Milliken, Univ. Calif. Pub. Bot. **2**: 42. 1904.

Type locality: "Coyote Canyon, at 5,000 ft. alt. on the desert slope of El Toro Mt."

Distribution: Known only from the region of the type locality. Transition.

Specimens examined: Coyote Canyon, Santa Rosa Mountains, *Hall 2130.*

HYDROPHYLLACEAE. WATER-LEAF FAMILY.

1. ERIODICTYON. YERBA SANTA.

Herbage aromatic, not glandular-pubescent.
  Leaves glutinous, nearly or quite glabrous at least above. 1. *E. trichocalyx.*
  Leaves not glutinous, more or less densely silky-tomentose on both surfaces.
    Corolla 8–12 mm. long, much exceeding the calyx. 2. *E. crassifolium.*
    Corolla 2–3 mm. long, scarcely exceeding the calyx. 3. *E. Traskiae.*
Herbage very heavy-scented, glandular-pubescent throughout, not at all tomentose. 4. *E. Parryi.*

1. ERIODICTYON TRICHOCALYX Heller, Muhlenbergia **1**: 108. 1904.

Eriodictyon glutinosum pubens A. Gray, Proc. Am. Acad. **17**: 224. 1882.

Type locality: "Seven Oaks Camp, San Bernardino Mountains."

Distribution: Southern California from the San Gabriel Mountains south to the Mexican Boundary. Upper Sonoran.

Specimens examined: Mount Wilson, in chaparral near the summit, *Abrams 2607;* mesas near San Bernardino, *S. B. & W. F. Parish 411;* Mount San Antonio, altitude 1800 meters, *Abrams 2685;* Edgar Canyon, San Bernardino Mountains, *Parish 2977;* in chaparral between Campo and Jacumba Hot Spring, *Abrams 3632;* Mount Wilson, *Davidson*, June 12, 1892; Rock Creek, altitude 1140 meters, *Abrams & McGregor 526.*

2. ERIODICTYON CRASSIFOLIUM Benth. Bot. Sulph. 35. 1844.

Eriodictyon tomentosum Benth. Bot. Sulph. 36. 1844.

Type locality: "San Diego."

Distribution: In the chaparral of the foothills and mountains from Santa Barbara County southward to northern Lower California. Upper and Lower Sonoran. The form occurring in the Lower Sonoran, especially in Riverside and San Diego Counties, is much more silky-tomentose than the more northern Upper Sonoran form.

Specimens examined: Santa Ynez Mountains, near Santa Barbara, *Brandegee*, 1888; Laurel Canyon, Santa Monica Mountains, *Hasse*, July, 1890; Glendora, *Braunton 293;* San Fernando Mountains near Chatsworth, *Abrams 1363;* Acton, *Elmer 3598;* Little Santa Anita Canyon, *Abrams 2627;* Newhall, *Davidson*, May 5, 1890; Fort Tejon, *Abrams & McGregor 300;* Sisar Canyon, Topatopa Mountains, *Abrams & McGregor 65;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 142, 159;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 322;* near Orange, *Agnes M. Bowman*, June, 1899; western base of San Jacinto Mountains, *Hall 2006;* San Jacinto, *Berg*, April 3, 1904; Witch Creek, *Alderson*, May, 1894; Mission Hills, near San Diego, *Abrams 3432;* Chollas Valley, *Susan G. Stokes*, June, 1895; San Diego, *Brandegee*, 1889; Point Loma, *Chandler 5067.*

3. Eriodictyon Traskiae Eastwood, Proc. Calif. Acad. III. **1**: 121. 1898.

Type locality: "On one volcanic upland on Santa Catalina Island, Calif., at an elevation of about 1500 feet."

Distribution: Santa Ynez Mountains on the mainland, and Santa Catalina Island. Upper Sonoran.

Specimens examined: Santa Ynez Mountains, *Elmer 4017;* the Sisquoc, Santa Barbara County, *Baker*, July, 1895.

4. Eriodictyon Parryi (A. Gray) Greene, Pittonia **2**: 22. 1889.
Nama Parryi A. Gray, Bot. Calif. **1**: 621. 1876.

Type locality: "On the Mohave slope of the San Bernardino Mountains."

Distribution: San Gabriel Mountains southward to the Cuiamaca Mountains, and probably extending into northern Lower California. Transition.

This is an anomalous species, strikingly different in habit; the tall, mostly simple, herbaceous stems arise from a more or less woody, branching base.

Specimens examined: Mount Gleason, San Gabriel Mountains, *Elmer 3643;* open pine forests in the vicinity of Strawberry Valley, San Jacinto Mountains, *Hall 2502;* between Cuiamaca and Oriflamme Canyon, Cuiamaca Mountains, *Abrams 3927;* Rock Creek, altitude 1650 meters, *Abrams & McGregor 577;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 386.*

MENTHACEAE. Mint Family.

Anther-bearing stamens 4.
    Ovary merely 4-lobed; stamens coiled in the bud, becoming long-exserted in flower. 1. *Trichostema.*
    Ovary deeply 4-parted; stamens not long-exserted.
        Calyx becoming much inflated. 2. *Salazaria.*
        Calyx not inflated. 3. *Sphacele.*
Anther-bearing stamens 2. 4. *Ramona.*

1. TRICHOSTEMA. Blue-curl.

Corolla-tube well-exserted beyond the calyx. 1. *T. lanatum.*
Corolla-tube scarcely exserted beyond the calyx. 2. *T. Parishii.*

1. Trichostema lanatum Benth. Lab. Gen. & Sp. 659. 1835.

Type locality: "Hab. in California." First collected by Douglas.

Distribution: On dry chaparral ridges from Monterey County southward to Orange County. In southern California this species is confined to the mountains toward the coast from the Santa Ana Mountains northward. Upper Sonoran.

Specimens examined: Sierra Madre, *Nevin 932;* near Los Angeles, *Wallace;* Santa Monica Mountains, *Abrams 1267;* Santiago Canyon, Santa Ana Mountains, *Helen D. Geis*, May, 1902; Silverado Canyon, Santa Ana Mountains, *Helen D. Geis 720* (a form with white instead of purple wool).

2. TRICHOSTEMA PARISHII Vasey, Bot. Gaz. **6**: 173. 1880.

Trichostema lanatum denudatum A. Gray, Syn. Fl. **2**, pt. 1: 459. 1886.

Type locality: "San Diego Co., Cal."

Distribution: On dry ridges of the more interior foothills and mountains of southern California, where it replaces the coastal and more northern *T. lanatum*. Upper Sonoran.

Specimens examined: Southern California, no locality given, *Vasey & Parish*, 1880; vicinity of San Bernardino, *Parish 3645;* Potrero, *Susan G. Stokes*, July, 1895; San Antonio Mountains, altitude 900 meters, *Hall 1482;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 666;* Acton, *Elmer 3698;* Jacumba Hot Spring, *Mearns 3352;* between Jacumba Hot Spring and Campo, *Abrams 3692*.

2. SALAZARIA.

1. SALAZARIA MEXICANA Torr. Bot. Mex. Bound. 133. 1859.

Type locality: "Ravines, Chihuahua, below Presidio del Norte near the Rio Grande."

Distribution: Dry washes of the arid region, from the Mohave Desert of southern California eastward to southern Utah, and southward to northern Mexico. Lower Sonoran.

Specimens examined: Mill Creek Canyon, Panamint Mountains, *Coville & Funston 756;* southern slope of Tehachapi Pass, *Brandegee*, July, 1884; *Abrams & McGregor 494;* Mohave Desert, *S. B. & W. F. Parish 893;* Mohave Desert, near Hesperia, *Parish 4932;* eastern base of the San Jacinto Mountains, along the borders of the Colorado Desert, *Hall 2107*.

3. SPHACELE. Pitcher sage.

1. Sphacele fragrans Greene, Pittonia **1**: 38. 1887.

Sphacele calycina Wallacei A. Gray, Syn. Fl. **2**, pt. 1: 365. 1878.

Type locality: "In canyons of the south side of Santa Cruz Island."

Distribution: On shady slopes in the foothills and mountains of the islands and on the mainland in the San Gabriel Mountains. Upper Sonoran.

Specimens examined: Santa Cruz Island, *Brandegee*, April, 1888; southern California, probably Santa Catalina Island, *Wallace;* Santa Catalina Island, *McClatchie*, Sept. 12, 1893; near Claremont, *Baker 5061;* Switzer's trail, San Gabriel Mountains, *Davidson*, June 12, 1893.

4. RAMONA.

- Bracts scarious-membranous.
  - Leaves entire, not at all rugose.
    - Inflorescence villous; bracts less than 10 mm. long. 1. *R. pilosa.*
    - Inflorescence puberulent; bracts 15 mm. long. 2. *R. pachystachya.*
  - Leaves crenulate, rugose. 3. *R. capitata.*
- Bracts herbaceous; leaves crenate, rugose.
  - Stems woody at base, scape-like, about 2 dm. high. 4. *R. humilis.*
  - Shrubs, 1–2 m. high.
    - Inflorescence verticillate-glomerate and interrupted-spicate; corolla-tube longer than the limb.
      - Corolla about 1 cm. long.
        - Bracts cuspidate-acuminate, somewhat tomentose. 5. *R. stachyoides.*
        - Bracts obtuse, hoary-tomentose. 6. *R. nivea.*
      - Corolla 2 cm. long.
        - Bracts acute or acute-cuspidate. 7. *R. Clevelandi.*
        - Bracts conspicuously aristate. 8. *R. Vaseyi.*
    - Inflorescence thyrsoid-paniculate; corolla-tube shorter than the limb. 9. *R. polystachya.*

1. **Ramona pilosa** (A. Gray).

Audibertia incana pilosa A. Gray, Syn. Fl. **2**, ed. 2, pt. 1: 461. 1886.

Type locality: "Northern base of San Bernardino Mountains, on the border of the Mohave Desert."

Distribution: Mohave Desert, chiefly in the juniper and yucca belts. Lower Sonoran.

Specimens examined: Northern base of the San Bernardino Mountains, Mohave Desert, *S. B. & W. F. Parish 1309;* Mohave Desert, about 1200 meters, *Parish 3847;* Acton, *Hasse*, May 21, 1893; Mescal Creek, Antelope Valley, *Hall 3026;* Mohave Desert, near Burcham's ranch, *Parish 4935;* Rock Creek, *Abrams & McGregor 547;* Palmdale, *Abrams & McGregor 523.*

2. Ramona pachystachya (A. Gray) Heller, Muhlenbergia **1**: 4. 1900.

Audibertia incana pachystachya A. Gray, Syn. Fl. **2**, ed. 2, pt. 1: 461. 1886.

Audibertia pachystachya Parish, Erythea **6**: 91. 1898.

Salvia carnosa compacta Hall, Univ. Calif. Pub. Bot. **1**: 111. 1902.

Type locality: "Bear Valley in the San Bernardino Mountains. Southern borders of San Diego Co."

Distribution: In the vicinity of Bear Valley, San Bernardino Mountains, and in the San Jacinto Mountains. Upper Sonoran and Transition.

Specimens examined: Eastern base of the San Jacinto Mountains, *Hall 2160;* Bear Valley, San Bernardino Mountains, *Parry*, 1876; *Parish 330;* The Pines, Santa Ana Canyon, altitude 1650 meters, *Abrams & McGregor 523.*

3. Ramona capitata (A. Gray) Briquet, Bull. Herb. Boiss. **2**: 440. 1894.

Audibertia capitata A. Gray, Proc. Am. Acad. **7**: 387. 1867.

Salvia mohavensis Greene, Pittonia **2**: 235. 1892.

Type locality: "Summit of Providence Mountain, Mohave Desert."

Distribution: Known only from the type locality. Upper Sonoran.

4. Ramona humilis (Benth.) Greene, Erythea **1**: 144. 1893.

Audibertia humilis Benth. Lab. Gen. & Sp. 313. 1833.

Salvia sonomensis Greene, Pittonia **2**: 236. 1892.

Type locality: "Hab. in California septentrionali."

Distribution: Coast Ranges and Sierra Nevada of northern and central California, also in the Cuiamaca Mountains. This is merely a low herbaceous plant with a woody caudex. Transition.

Specimens examined: Cuiamaca Mountain, *Brandegee*, June 15, 1894; between Cuiamaca Lake and Oriflamme Canyon, *Abrams 3938*.

5. RAMONA STACHYOIDES (Benth.) Briquet, Bull. Herb. Boiss. **2**: 440. 1894.

Audibertia stachyoides Benth. Lab. Gen. & Sp. 313. 1833.
Salvia mellifera Greene, Pittonia **2**: 236. 1892.

Type locality: "In California septentrionali."

Distribution: Santa Cruz and Mount Hamilton ranges southward to northern Lower California. In southern California this is one of the common and characteristic shrubs of the dry plains and foothills. It is commonly called "black sage," and is highly prized by bee-keepers. Upper Sonoran.

Specimens examined: Montecito, *Bingham 30;* Mission Canyon, Santa Barbara, *Abrams*, March 6, 1909; Sepulveda Canyon, Santa Monica Mountains, *Abrams 2540;* Pasadena, *McClatchie*, May 20, 1897; near Orange, *Miss Bowman*, June, 1899; plains near San Bernardino, *Parish 4795;* San Diego, *Palmer 301; Dunn*, March 21, 1891; *Miss Susan G. Stokes*, June, 1895; Point Loma, *Chandler 5063;* Big Tejunga wash, San Fernando Valley, *Abrams 1391;* Ramona, *Brandegee* (distributed by *C. F. Baker 3410*).

6. RAMONA NIVEA (Benth.) Briquet, Bull. Herb. Boiss. **2**: 440. 1894.

Audibertia nivea Benth. Lab. Gen. & Sp. 313. 1833.
Salvia leucophylla Greene, Pittonia **2**: 236. 1892.

Type locality: "In California septentrionali."

Distribution: A common shrub on the low foothills from Santa Barbara County south to the Santa Ana Mountains. Upper Sonoran.

Specimens examined: Near Ojai, *Peckham*, 1866; Santa Barbara County, *Rothrock 4, 133; Bolander*, 1873; San Francisquito Canyon, *Parish*, June, 1887; Newhall, *Pringle*, May 20, 1882; *A. Gray*, May, 1885; Saugus, *Grant 1105;* Sulphur Mountain, *Abrams & McGregor 13;* Sespe Creek, near Ten Sycamore Flat, *Abrams & McGregor 185*.

7. Ramona Clevelandi (A. Gray) Briquet, Bull. Herb. Boiss. **2**: 440. 1894.

Audibertia Clevelandi A. Gray, Proc. Am. Acad. **10**: 76. 1874.
Salvia Clevelandi Greene, Pittonia **2**: 236. 1892.
Audibertia Palmeri A. Gray, Bot. Calif. **1**: 601. 1876.
Salvia Palmeri Greene, Pittonia **2**: 236. 1892.
Ramona Palmeri Briquet, Bull. Herb. Boiss. **2**: 440. 1894.

Type locality: "Mountains behind San Diego, California, at the elevation of about 2,200 feet."

Distribution: In the chaparral of western San Diego County and Santa Catalina Island, southward to northern Lower California. Upper Sonoran.

Specimens examined: Tigh's ranch, near Cuiamaca, *Palmer 302;* San Juan Capistrano, *Nevin 686;* Santa Catalina Island, *Lyon 12;* near Potrero, *Abrams 3745;* Descanso, *Parish 4424;* near Ramona, *Abrams 3778;* near Valley Centre, *Chandler 5349.*

8. Ramona Vaseyi (Porter) Briquet, Bull. Herb. Boiss. **2**: 440. 1894.

Audibertia Vaseyi Porter, Bot. Gaz. **6**: 207. 1881.
Type locality: "Mountain Springs, San Diego County, California."

Distribution: Desert slopes of the mountains of southern California from Morongo Pass south to the Mexican Boundary. Lower Sonoran.

Specimens examined: Morongo wash, *Parish 3233;* Mountain Springs, *Vasey*, 1880.

9. Ramona polystachya (Benth.) Greene, Pittonia **2**: 235. 1892.

Audibertia polystachya Benth. Lab. Gen. & Sp. 314. 1833.

Type locality: "In California septentrionali."

Distribution: Monterey County southward to northern Lower California. This is a very common shrub on the low hills and dry plains of southern California, and is commonly called "white sage." Upper and Lower Sonoran.

Specimens examined: Mountain Drive, near Santa Barbara, *Abrams 4125;* Acton, *Elmer 3684;* Sierra Madre, *Abrams 2642;* Claremont, *Baker 4155;* San Bernardino, *Parish 4796;* Coronado, *Chandler 5172;* San Diego, *Thurber 530; Palmer 300; Miss Susan*

G. Stokes, July, 1895; Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 147;* Rock Creek, altitude 1350 meters, *Abrams & McGregor 569.*

SOLANACEAE. NIGHTSHADE FAMILY.

- Corolla rotate; stamens connivent. 1. *Solanum.*
- Corolla tubular or funnelform; stamens not connivent.
  - Fruit a berry, sometimes becoming nearly dry. 2. *Lycium.*
  - Fruit capsular. 3. *Nicotiana.*

1. SOLANUM. NIGHTSHADE.

- Corolla 5-cleft; peduncles longer than the pedicels. 1. *S. Douglasii.*
- Corolla 5-toothed or 5-lobed; peduncles shorter than the pedicels.
  - Leaves entire; stems glabrate or viscid-pubescent.
    - Herbage viscid-pubescent. 2. *S. Xanti.*
    - Herbage glabrate or hispidulous. 2*a*. *S. Xanti glabrescens.*
  - Leaves crenate; stems long-hirsute. 3. *S. Wallacei.*

1. SOLANUM DOUGLASII Dunal, in DC. Prod. **13**, pt. 1: 48. 1852.

Solanum nigrum Douglasii A. Gray, Bot. Calif. **1**: 538. 1876.

Solanum umbelliferum trachycladum Torr. Pacif. R. Rep. **7**: 17. 1856.

Type locality: "In Nova California."

Distribution: In the coastal region from Monterey southward to northern California. This native plant, more or less woody, and perennial, is clearly distinct from the European annual, *S. nigrum,* which occasionally appears as a wayside weed. Upper Sonoran.

Specimens examined: Playa del Rey, *Abrams 1216;* Inglewood, *Abrams 2488;* near Monrovia, *Dudley*, Dec. 1907; Sulphur Mountain, *Abrams & McGregor 23;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 690.*

2. SOLANUM XANTI A. Gray, Proc. Am. Acad. **11**: 90. 1876.

Solanum Xanti intermedium Parish, Proc. Calif. Acad. III. **2**: 168. 1901.

Type locality: Xantus' specimens were collected at Fort Tejon.

Distribution: Foothills of the Sierra Nevada, southward through southern California. Upper Sonoran.

Specimens examined: Cajon Pass, *Hall 3000;* Claremont, *Chandler*, 1897; Mount Wilson, *Abrams 2586;* Campo, *Abrams 3593;* Sawpit Canyon, near Monrovia, *Dudley*, Dec. 18, 1907; Liebre Mountain, *Abrams & McGregor 336;* Rock Creek, *Abrams & McGregor 597;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 154.*

2*a*. SOLANUM XANTI GLABRESCENS (Torr.) Parish, Proc. Calif. Acad. III. **2**: 169. 1901.

Solanum umbelliferum glabrescens Torr. Pacif. R. Rep. **7**: 17. 1856.

Type locality: "Santa Ynez; also between San Bernardino and San Gabriel."

Distribution: Southern Oregon southward to Lower California and northern Arizona. Upper and Lower Sonoran.

Specimens examined: Dry hillsides near San Dieguito, *Abrams 3362;* Oceanside, *Parish 4437;* San Diego, *Palmer 260;* San Ysabel, *Henshaw*, April 9, 1893; La Mesa, *Chandler 5059;* Riverside, *Hall 2929;* San Bernardino, *Parish 4384;* between San Bernardino and San Gabriel, *Antisell;* Gaviota, *Elmer 3957;* vicinity of San Bernardino, *Parish 4692;* Lytle Creek Canyon, *Hall 1224;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2556.*

3. SOLANUM WALLACEI (A. Gray) Parish, Proc. Calif. Acad. III. **2**: 166. 1901.

Solanum Xanti Wallacei A. Gray, Proc. Am. Acad. **11**: 91. 1876.

Type locality: "Island of Catalina off San Pedro, California."

Distribution: Foothills of Santa Ynez Mountains and on the islands off the coast of southern California. Upper Sonoran.

Specimens examined: Santa Catalina Island, *Wallace;* Santa Barbara, *Wheelock*, Feb. 24, 1893; Bartlette Canyon, *Rothrock 131;* Mountain Drive, near Santa Barbara, *Abrams 4139.*

2. LYCIUM. BOX-THORN.

Herbage not glandular-pubescent.
    Calyx-lobes lanceolate, exceeding the tube. 1. *L. Richii.*
    Calyx-lobes oblong or triangular, shorter than the tube.
        Corolla-tube short, not exceeding the calyx. 2. *L. californicum.*
        Corolla-tube about 3 times the length of the calyx.

Herbage glabrous or nearly so; calyx-lobes triangular, much shorter than the tube.
  Leaves mostly 2–3 cm. long; calyx-lobes tomentose on the margins; filaments woolly at base. 3. *L. Torreyi.*
  Leaves mostly less than 1 cm. long; calyx-lobes glabrous or nearly so; filaments sparsely hairy at base. 4. *L. Andersonii.*
Herbage pubescent; calyx-lobes oblong, nearly equaling the tube. 5. *L. Parishii.*
Herbage glandular-pubescent; corolla more or less pubescent. 6. *L. Cooperi.*

1. LYCIUM RICHII A. Gray, Proc. Am. Acad. **6**: 46. 1862.

Lycium Hassei Greene, Pittonia **1**: 222. 1888.

Type locality: "La Paz, South California."

Distribution: On the islands off the coast of southern California, and also on the mainland in the vicinity of San Diego. Upper and Lower Sonoran.

Specimens examined: Santa Catalina Island, *Hasse*, July 15, 1888; San Diego, *Susan G. Stokes*, July, 1895.

2. LYCIUM CALIFORNICUM Nutt.; A. Gray, Bot. Calif. **1**: 542. 1876.

Type locality: "Near San Diego on clay-hill slopes."

Distribution: On bluffs near the sea and occasionally in subalkaline soils in the interior of southern California and northern Lower California. Upper and Lower Sonoran.

Specimens examined: San Diego, *Nuttall; Palmer 262; Cooper*, March, 1862; San Pedro Hills, near Rocky Point, *Abrams 3131;* Wilmington, *Pringle*, March 31, 1882; Santa Monica, *Parry 216;* near Acton, *Elmer 3757;* Laguna Beach, *Helen D. Geis 581.*

3. LYCIUM TORREYI A. Gray, Proc. Am. Acad. **6**: 47. 1862.

Type locality: "Texas on the Rio Grande, to Fort Yuma, interior of California, along the Mexican boundary."

Distribution: Southern Utah, southward to western Texas, Chihuahua and Sonora. Lower Sonoran.

Specimens examined: Fort Yuma, *Thomas*, March 3, 1855.

4. LYCIUM ANDERSONII A. Gray, Proc. Am. Acad. **7**: 388. 1867.

Lycium Andersonii Wrightii A. Gray, Bot. Calif. **1**: 543. 1876.

Type locality: "S. E. part of State of Nevada."

Distribution: Southern Arizona and southern California on the Colorado Desert and in the vicinity of San Diego. Lower Sonoran.

Specimens examined: San Diego, *Jones*, April 5, 1882; *Abrams 3464;* Tia Juana, *Abrams 3491;* Morongo Pass, *S. B. & W. F. Parish 11-a;* Palm Springs, *Parish 4132;* Mohave River, *Palmer*, May, 1876; Elsinore, *Baker*, *4145;* Vallecitos, *Brandegee*, April 10, 1896.

5. Lycium Parishii A. Gray, Proc. Am. Acad. **20**: 305. 1884.

Type locality: "Mesas in San Bernardino Valley, S. California."

Distribution: This was described from a single bush which according to Mr. Parish has since been destroyed. The species has never been rediscovered. Lower Sonoran.

Specimens examined: Mesa south of San Bernardino, *Parish*, May, 1885.

6. Lycium Cooperi A. Gray, Proc. Am. Acad. **7**: 388. 1867.

Lycium Cooperi pubiflora A. Gray, Syn. Fl. **2**, pt. 1: 238. 1878.

Type locality: "East slope of Providence Mountain, in the Mohave District, California."

Distribution: Mohave and Colorado Deserts, eastward to Arizona. Lower Sonoran.

Specimens examined: Between Calexico and Signal Mountain, on the International Boundary, *Abrams 3149;* Palmdale, *Elmer 3661;* Victor, *Palmer 223½*; Mohave Desert, *Pringle*, May 18, 1882.

3. NICOTIANA. Tobacco.

1. Nicotiana glauca R. Grah. Edinb. N. Phil. Journ. 175. 1828.

Type locality: "It was raised in 1827 from seeds communicated, without specific name, to the Royal Botanical Garden, Edinburgh, by Mr. Smith at Monkwood, whose son sent them from Buenos Ayres."

Distribution: The tree-tobacco, which is naturalized from South America, is frequent in waste places and along dry washes of streams, often found extending well up into the canyons. Upper and Lower Sonoran.

Specimens examined: Gaviota, *Elmer 3997;* Santa Ana, *Agnes M. Bowman*, April, 1899; Tia Juana, *Susan G. Stokes*, June, 1895.

SCROPHULARIACEAE. FIGWORT FAMILY.

Stamens 4, the fifth represented by a sterile filament. 1. *Pentstemon.*
Stamens 4, the fifth wholly wanting. 2. *Diplacus.*

1. PENTSTEMON. BEARD-TONGUE.

Corolla red; tube elongated, narrow; limb strongly bilabiate; leaves serrate or denticulate.
  Leaves ovate; scandant over shrubs. 1. *P. cordifolius.*
  Leaves linear-lanceolate, remote and often ternate on the virgate, herbaceous branches. 2. *P. ternatus.*
Corolla yellow or tinged with purple; tube short.
  Leaves entire; sterile filament densely bearded. 3. *P. antirrhinoides.*
  Leaves few-toothed; sterile-filament not bearded.
    Stems and leaves puberulent. 4. *P. jacintensis.*
    Stems and leaves glabrous. 5. *P breviflorus.*

1. PENTSTEMON CORDIFOLIUS Benth. Scroph. Ind. Introd. 7. 1835.

Type locality: "A new California species collected by Mr. Douglas."

Distribution: Common in the chaparral belt, from Santa Barbara County to northern Lower California; also on the islands off the coast. Upper Sonoran.

Specimens examined: California, probably Santa Barbara, *Douglas;* Santa Barbara, *Rich; Elmer 3956;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2545;* Claremont, *Baker 3441;* Los Tunas Canyon, Santa Monica Mountains, *Abrams 1694;* foothills, of the San Bernardino Mountains, *Parish*, July 8, 1898; Lytle Creek Canyon, *Hall*, June 17, 1899; Jamul Valley, *Palmer 273;* Cottonwood Valley, *Abrams 3905;* Sycamore Canyon, San Diego County, *Chandler 5328;* Mission Valley, *Susan G. Stokes*, June, 1895; Alpine, San Diego County, *Mearns 3940;* near Pasadena, *Grinnell*, July 3, 1903; Santa Monica Canyon, *Abrams 1468;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 150.*

2. PENTSTEMON TERNATUS Torr. Bot. Mex. Bound. **2**: 115. 1859.

Type locality: "Mountains east of San Diego."

Distribution: Chaparral belt of the interior mountains of southern California. Upper Sonoran.

Specimens examined: Vicinity of Fort Tejon, *Xantus 63;* Acton, *Elmer 3597;* Pasadena, *McClatchie*, June 28, 1893; Waterman Canyon, San Bernardino Mountains, *Hall*, July 13, 1899; foothills, San Bernardino Mountains, *Parish*, June 1, 1898; Clark's ranch, San Bernardino Mountains, *Abrams 2939*; mountains east of San Diego, *Parry*, 1850 (type); Potrero, *Susan G. Stokes*, July, 1895; *Abrams 3726;* Claremont, *Baker 5967;* Julian, *Palmer 274;* Palomar Mountains, *Chandler 5441;* Chalk Hill, San Jacinto Mountains, *Hall 2634;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 394;* Cajon Pass, *Abrams & McGregor 698.*

3. PENTSTEMON ANTIRRHINOIDES Benth.; A. DC. Prod. **10**: 594. 1846.

Type locality: "In California." First collected by Coulter.

Distribution: In the chaparral of the low foothills and plains, from the vicinity of San Bernardino and the Santa Ana Mountains, southward to northern Lower California. Lower and Upper Sonoran.

Specimens examined: Colton, *Jones 3178;* near San Bernardino, *Parish*, May 26, 1898; Reche Canyon, *Hall*, May 17, 1899; Elsinore, *McClatchie*, May 20, 1893; near San Jacinto, *Leiberg 3220; Foster*, *Hall 3879;* San Miguel Mountain, *Chandler 5273;* Potrero, *Abrams 3712;* near Fallbrook, *Abrams 3347;* San Ysabel, *Henshaw 146;* Silverado Canyon, Santa Ana Mountains, *Helen D. Geis 735;* canyon of the San Jacinto River, *Hall 2016*, June, 1901.

4. PENTSTEMON JACINTENSIS Abrams, Bull. Torrey Club **33**: 445. 1906.

Type locality: "San Jacinto Mountain, altitude 9,000 feet."

Distribution: Open pine forests of the San Jacinto Mountains. Transition.

Specimens examined: San Jacinto Mountain, *S. B. & W. F. Parish 473; Hall 704;* Tahquitz Valley, *Hall 2588; F. Grinnell*, July, 1908.

5. **Pentstemon breviflorus** Lindl. Bot. Reg. **23**: *pl. 1946.* 1837.

Type locality: Collected by Douglas, probably near Monterey.

Distribution: Foothills of the Coast Ranges and the Sierra Nevada in Central California, extending southward to the Liebre Mountains in southern California. Upper Sonoran.

Specimens examined: Between Oakgrove Canyon and Elizabeth Lake, *Abrams & McGregor 409.*

2. DIPLACUS. Bush monkey-flower.

Flowers yellow or buff.
  Corolla-tube much exceeding the calyx; lobes not erose-toothed; calyx and leaves not pubescent. 1. *D. aridus.*
  Corolla-tube proper not exceeding the calyx; lobes erose-toothed; leaves pubescent beneath; calyx usually woolly. 2. *D. longiflorus.*
Flowers scarlet; corolla-lobes not erose-toothed; calyx glabrous. 3. *D. puniceus.*

1. **Diplacus aridus** Abrams, Bull. Torrey Club **32**: 540. 1905.

Type locality: "Growing on dry rocky ridges at Jacumba near the boundary monument."

Distribution: Desert slopes of the Cuiamaca Mountains near the International Boundary. Upper Sonoran.

Specimens examined: Jacumba Hot Spring, *Abrams 3656.*

2. **Diplacus longiflorus** Nutt. Ann. Nat. Hist. **1**: 139. 1838.

Mimulus glutinosus brachypus A. Gray, Bot. Calif. **1**: 566. 1876.
Diplacus arachnoideus Greene, Bull. Calif. Acad. **1**: 210. 1885.
Diplacus calycinus Eastw. Bot. Gaz. **41**: 287. 1906.

Type locality: "In rocky places by small streams, in the vicinity of Sta. Barbara (Upper California)."

Distribution: Southern Sierra Nevada and Santa Barbara County, southward to northern Lower California. Upper Sonoran.

The form with a glabrous calyx, which occurs in San Diego County, may be distinct, but the genus needs a thorough revision before more forms are segregated.

Specimens examined: Santa Barbara, *Elmer 3959;* Mission Canyon, near Santa Barbara, *Eastwood 19;* Los Angeles, *Hasse*, Oct. 1887; Sepulveda Canyon, Santa Monica Mountains, *Abrams 2543;* vicinity of San Bernardino, *Parish 4792;* Ysidora, *Abrams 3287;* between Campo and Potrero, *Abrams 3716.*

3. Diplacus puniceus Nutt. Ann. Nat. Hist. **1**: 137. 1838.

Diplacus glutinosus puniceus Benth. DC. Prod. **10**: 368. 1844.
Mimulus glutinosus puniceus A. Gray, Bot. Calif. **1**: 566. 1876.

Type locality: "In sandy loam by the borders of small winter streams, attaining commonly the height of a man, growing near to Sta. Diego, in Upper California."

Distribution: Riverside County and the Santa Ana Mountains, southward to northern Lower California, also on the islands off the southern California coast. Upper and Lower Sonoran.

Specimens examined: Vicinity of Riverside, *Hall 2928;* San Diego, *Palmer 283; Thurber 545;* San Luis Rey River, *Parish 4461;* Palomar Mountain, *Hall*, May 31, 1899; Ysidora, *Abrams 3285;* Mission Hills, San Diego, *Hall 5053;* Fallbrook, *Jones 3439*.

ACANTHACEAE. Acanthus Family.

1. BELOPERONE.

1. Beloperone californica Benth. Bot. Sulph. 38. 1844.

Jacobina californica Nees, DC. Prod. **11**: 729. 1847.
Seriocographis californica A. Gray, in Torr. Bot. Mex. Bound. 125. 1859.

Type locality: "Cape San Lucas," Lower California.

Distribution: Colorado Desert of southern California, southward through the desert regions of Lower California. Lower Sonoran.

Specimens examined: Palm Springs, *Parish 4136;* Coyote Canyon, altitude 200 meters, *Hall 2767;* Vallecitos, Colorado Desert, *Brandegee*, March 26, 1901; near Coachella, *Hall 5776*.

BIGNONIACEAE. Trumpet-creeper Family.

1. CHILOPSIS. Flowering willow.

1. Chilopsis linearis (Cav.) Sweet, Hort. Brit. 283. 1827.

Bignonia linearis Cav. Ic. **3**: 35, *pl. 269*. 1794.
Chilopsis saligna Don. Edinb. Phil. Journ. **9**: 261. 1823.

Type locality: Not given.

Distribution: Mohave Desert, southward and eastward to western Texas and Mexico. Growing along dry washes and stream beds of the desert mountains. In southern California extending into the coastal slope through the Morongo Pass. Lower Sonoran.

Specimens examined: Eastern base of San Jacinto Mountain, *Hall 2112;* Warner's ranch, San Diego County, *Susan G. Stokes*, Aug. 1895; Cushenberry Springs, north slope of San Bernardino Mountains, *Abrams 2142;* San Felipe, *Abrams 3979.*

CAPRIFOLIACEAE. HONEYSUCKLE FAMILY.

Leaves pinnate; corolla rotate.	1. *Sambucus.*
Leaves simple.	
Corolla short-campanualte, regular; berry white.	2. *Symphoricarpus.*
Corolla tubular, irregular; berry red or black.	3. *Lonicera.*

1. SAMBUCUS. ELDER.

Fruit without bloom.	1. *S. mexicana.*
Fruit with a glacuous bloom.	
Herbage pubescent.	2. *S. velutina.*
Herbage glabrous.	3. *S. coerulea.*

1. SAMBUCUS MEXICANA Presl.; DC. Prod. **4**: 322. 1830.

Type locality: "In Mexico."

Distribution: Southern California to Texas and south through Mexico and Costa Rica, according to Schwerin. I have not seen any specimen that can be referred to this species with certainty. but fruiting material has been seldom collected, and it may be that some of the material referred to the next species belongs here.

*2. SAMBUCUS VELUTINA Dur. & Hilg. Pacif. R. Rep. **5**: 8. 1855,

Sambucus coerulea velutina Schwerin, Mitt. Deutsch. Dendr. Ges. **1909**: 37, 328. 1909.

Type locality: "Pose Creek," Kern County, California.

Distribution: Southern Sierra Nevada and the mountains of southern California. The herbage is usually densely pubescent, but occasionally nearly glabrous forms occur. Upper Sonoran and Transition.

Specimens examined: Bear Valley, San Bernardino Mountains, *Hall 1347;* Mount San Antonio, altitude 2400 meters, *Abrams 2710;*

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*After this paper went to the printer Greene (Leaflets **2**: 99) described several new species of *Sambucus*, one of which, *Sambucus coriacea*, is the pubescent form in the foothills of Santa Barbara and Ventura Counties. I had tentatively referred these plants to *S. velutina.*

Water Canyon, Tehachapi Mountains, *Abrams & McGregor 493;* Rock Creek, San Gabriel Mountains, altitude 1800 meters, *Abrams & McGregor 596;* Santa Barbara, *Elmer 3836;* Sulphur Mountain, *Abrams & McGregor 6;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 139.*

3. SAMBUCUS COERULEA Raf. Alsog. Am. 48. 1838.

Sambucus glauca Nutt. in Torr. & Gray, Fl. N. Am. **2**: 13. 1841.

Type locality: "Mentioned by Lewis and Clarke trav. 2, p. 160 as growing near Origon Mts."

Distribution: Idaho and Washington, southward through western Nevada and California to northern Lower California. In southern California this elder is common in the foothills and in both the coastal and interior valleys. Upper Sonoran.

Specimens examined: Vicinity of San Bernardino, *Parish*, 1898; Chatsworth, *Abrams 1326;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 2538;* Oneonta, *Chandler 5117;* Jamacha, *Chandler 5254;* Fort Tejon, *Abrams & McGregor 299;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 329;* Swartout Canyon, San Gabriel Mountains, *Abrams & McGregor 630;* Lone Pine Canyon, San Gabriel Mountains, *Abrams & McGregor 686;* Tia Juana River, near the initial monument, *Herre*, Aug. 8, 1902.

2. SYMPHORICARPUS Dill. SNOWBERRY.

Corolla short-campanulate, lobes equaling the tube.	1. *S. mollis.*
Corolla tubular-funnelform, lobes shorter than the tube.	2. *S. Parishii.*

1. SYMPHORICARPUS MOLLIS Nutt. in Torr. & Gray, Fl. N. Am. 2: 4. 1841.

Symphoricarpus ciliatus Nutt. in Torr. & Gray, Fl. N. Am. **2**: 4. 1841.

Type locality: "St. Barbara, California."

Distribution: Coast ranges and foothills of the Sierra Nevada of central California, southward to the Cuiamaca Mountains. Upper Sonoran.

Specimens examined: Santa Barbara *Nuttall; A. Gray*, 1885; Sepulveda Canyon, Santa Monica Mountains, *Abrams 347, 2552;* Spencer Valley, near Julian, *Abrams 3785;* Mount Wilson, *Grant 1260.*

2. Symphoricarpus Parishii Rydb. Bull. Torrey Club **26**: 545. 1899.

Type locality: "San Bernardino Mountains."

Distribution: San Gabriel Mountains, southward to the San Jacinto Mountains. Transition and Canadian Zones.

Specimens examined: Bear Valley, San Bernardino Mountains, *Abrams 2081;* Tamarack Valley, altitude 2700 meters, San Jacinto Mountains, *Hall 2485;* Swartout Canyon, San Gabriel Mountains, altitude 1950 meters, *Abrams & McGregor 638;* Dry Lake, San Bernardino Mountains, altitude 2700 meters, *Abrams & McGregor 787.*

3. LONICERA. Honeysuckle.

Flowers in terminal clusters.	
Inflorescence pubescent.	
Uppermost leaves connate.	1. *L. hispidula californica.*
Leaves all distinct.	
Leaves tomentose beneath.	2. *L. subspicata.*
Leaves nearly or quite glabrous and green beneath.	2a. *L. subspicata denudata.*
Inflorescence glabrous.	3. *L. interrupta.*
Flowers on axillary peduncles, in pairs.	4. *L. Ledebourii.*

1. Lonicera hispidula californica (Torr. & Gray) Rehder, Rep. Mo. Bot. Gard. **14**: 178. 1903.

Lonicera californica Torr. & Gray, Fl. N. Am. **2**: 7. 1841.
Caprifolium californicum K. Koch, Hort. Dendr. 294. 1853.
Lonicera hispidula vacillans A. Gray, Proc. Am. Acad. **8**: 628. 1873.
Caprifolium hispidulum californicum Greene, Fl. Fran. 347. 1892.

Type locality: "At San Francisco, *Douglas.*"

Distribution: British Columbia southward to the Sierra Nevada and Coast Ranges of central California. This species is not known on the mainland in southern California, but a form with "the inflorescence densely glandular-pubescent" has been collected on Catalina Island by Blanche Trask, according to Rehder.

2. Lonicera subspicata Hook. & Arn. Bot. Beechy 349. 1840.

Caprifolium subspicatum K. Koch, Hort. Dendr. 294. 1853.
Lonicera hispidula subspicata A. Gray, Proc. Am. Acad. **8**: 628. 1873.

Type locality: "California." First collected by Douglas, probably at Santa Barbara.

Distribution: Santa Barbara and Fort Tejon southward to the Santa Ana and San Jacinto Mountains. This is the common species in the chaparral of the coastal slope. Upper Sonoran.

Specimens examined: Santa Barbara, *Douglas; Nuttall;* Bartlett Canyon, Santa Ynez Mountains, *Rothrock 124;* Mountain Drive, near Santa Barbara, *Abrams 4148;* near Santa Barbara, *Elmer 3729;* Sepulveda Canyon, Santa Monica Mountains, *Abrams 367*, Strawberry Valley, San Jacinto Mountains, *Hall 2529;* near Santa Ana, *Helen D. Geis 518;* Arroyo Seco, near Pasadena, *Grinnell*, June 27, 1903; Sawpit Canyon, San Gabriel Mountains, *Dudley*, Dec. 1907; Fort Tejon, *Abrams & McGregor 309;* Cleghorn Canyon, San Bernardino Mountains, *Abrams & McGregor 704;* Waterman Canyon, San Bernardino Mountains, *Shaw & Illingsworth 9, 226.*

2a. LONICERA SUBSPICATA DENUDATA Rehder, Rep. Mo. Bot. Gard. **14**: 176. 1903.

Type locality: "San Diego," and also "Santo Thomas hills," Lower California.

Distribution: Foothills of San Diego County southward into Lower California. Upper Sonoran.

Specimens examined: San Diego, *Thurber 558* (type); *Susan G. Stokes*, July 10, 1895; Spencer Valley, near Julian, *Abrams 3804* (a form approaching the type); Chollas Valley, *Orcutt 120.*

3. LONICERA INTERRUPTA Benth. Pl. Hartw. 313. 1849.

Lonicera hispidula interrupta A. Gray, Proc. Am. Acad. **8**: 628. 1873.

Caprifolium interruptum Greene, Fl. Fran. 347. 1892.

Type locality: "Juxta carmel prope Monterey."

Distribution: Northern Coast Ranges and the Sierra Nevada southward to the desert slopes of the San Gabriel Mountains.

Specimens examined: Newhall, *Hasse 605;* Red Reef Canyon, Topatopa Mountains, *Abrams & McGregor 136;* Oakgrove Canyon, Liebre Mountains, *Abrams & McGregor 326, 395;* Swartout Canyon, San Gabriel Mountains, *Abrams & McGregor 629.*

4. Lonicera Ledebourii Esch. Mem. Acad. Sci. Petersb. **10**: 284. 1826.

Chamaecerasus Ledebourii Billiard, L'Hort. Franc. **1861**: 256. 1861.
Lonicera intermedia Kell. Proc. Calif. Acad. **1**: 154. 1863.
Caprifolium Ledebourii Kuntze, Rev. Gen. Pl. **1**: 274. 1891.
Distegia Ledebourii Greene, Man. Bot. Bay Reg. 164. 1894.
Xylosteum Ledebourii Howell ,Fl. N. W. Am. **1**: 282. 1900.
Lonicera involucrata Ledebourii Hort.; Zabel in Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 461. 1903.

Type locality: Collected by Eschscholtz, probably in the vicinity of San Franscisco.

Distribution: In moist shady places along streams; Santa Barbara northward through the Coast ranges and along the western slope of the Sierra Nevada to northern California. Transition and Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 4138.*

AMBROSIACEAE. Ragweed Family.

Involucre of pistillate heads with broad silvery scarious wings.
1. *Hymenoclea.*
Involucre of pistillate heads armed with several rows of prickles.
2. *Gaertneria.*

1. HYMENOCLEA.

Involucral bracts of pistillate heads spirally alternate, 5 mm. broad.
1. *H. Salsola.*
Involucral bracts of pistillate heads in a single whorl, 1–2 mm. broad.
2. *H. monogyra.*

1. Hymenoclea Salsola Torr. & Gray, Pl. Fendl. 79. 1849.

Type locality: "Sandy, saline uplands near the Mohave River, in the interior desert of California." Transition and Upper Sonoran.

Distribution: A common shrub in the sandy washes throughout the desert region. Lower Sonoran.

Specimens examined: Palmdale, *Elmer 3622;* Mohave Desert, *Brandegee;* Whitewater, *Vasey*, Feb., 1881; Palm Springs, *Parish 4123;* San Felipe, *Vasey*, June, 1880; Rock Creek, *Abrams & McGregor 542;* Willow Springs, *Abrams & McGregor 422.*

2. HYMENOCLEA MONOGYRA Torr. & Gray, Pl. Fendl. 79. 1849.

Type locality: "Along the valley of the Gila."

Distribution: In the vicinity of San Diego and adjacent Lower California, eastward to western Texas. Lower Sonoran.

Specimens examined: Chollas Valley, *Susan G. Stokes*, Aug. 25, 1895; Mission Valley, San Diego, *Brandegee*, Aug. 1902; San Diego, *Orcutt*, Oct. 11, 1883.

2. GAERTNERIA.

Spines of the bur straight.
  Leaves pinnately parted; spines glabrous or minutely pubescent. 1. *G. dumosa.*
  Leaves sinuate-toothed to sinuate-pinnatifid; spines villous. 2. *G. eriocentra.*
Spines of the bur uncinate.
  Leaves petioled, crenately toothed. 3. *G. chenopodifolia.*
  Leaves clasping, coarsely spinose-dentate. 4. *G. ilicifolia.*

1. GAERTNERIA DUMOSA (A. Gray) Kuntze, Rev. Gen. Pl. **1**: 339. 1891.

Franseria dumosa A. Gray, in Frem. Second Rep. 316. 1845.

Type locality: "On the sandy uplands of the Mohave River, and very common in all that region of North California."

Distribution: A very common and characteristic shrub of the Mohave and Colorado Deserts, extending eastward to southern Utah, and southward into northern Mexico and Lower California. Lower Sonoran.

Specimens examined: Signal Mountain, Imperial County, *Abrams 3179;* Mohave Desert, *Brandegee;* Palm Springs, *Parish 4121.*

2. GAERTNERIA ERIOCENTRA (A. Gray) Kuntze, Rev. Gen. Pl. **1**: 339. 1891.

Franseria eriocentra A. Gray, Proc. Am. Acad. **7**: 355. 1868.

Type locality: "East slope of Providence Mountain, Arizona."

Distribution: From the Providence Mountains, eastward through southern Nevada and adjacent Arizona. Lower Sonoran.

Specimens examined: I have not seen any specimens from southern California.

3. **Gaertneria chenopodifolia** (Benth.)

Franseria chenopodifolia Benth. Bot. Sulph. 26. 1844.

Type locality: "Bay of Magdalena."

Distribution: On the south slopes of hills at Tia Juana, and extending southward into Lower California. Lower Sonoran.

Specimens examined: Tia Juana, *Abrams 3476.*

4. GAERTNERIA ILICIFOLIA (A. Gray) Kuntze, Rev. Gen. Pl. **1**: 339. 1891.

Franseria ilicifolia A. Gray, Proc. Am. Acad. **11**: 77. 1876.

Type locality: "Great Canyon of the Tantillas Mountains, near the northern border of Lower California."

Distribution: Colorado Desert along the southern border of the State, extending southward on the desert slopes of Lower California. Lower Sonoran.

Specimens examined: Signal Mountain, *Abrams 3184.*

ASTERACEAE. ASTER FAMILY.

Anthers not caudate at base.

Receptacle naked.

Pappus of capillary-bristles, except *Gutierrezia;* involucral bract not scarious-margined.

Involucral bracts imbricated.

Involucral bracts striate; style-branches thickened above, stigmatic only below the middle. 1. *Eupatorieae.*

Involucral bracts not striate; style-branches with flattened terminal appendages, stigmatic to above the middle. 2. *Astereae.*

Involucral bracts in 1 or 2 series, not imbricated, except *Lepidospartum;* style-branches stigmatic to the summit. 6. *Senecioneae.*

Pappus not of capillary-bristles; involucral bracts imbricated, scarious-margined. 5. *Anthemideae.*

Receptacle with chaffy bracts. 4. *Heliantheae.*

Anthers caudate at base. 3. *Inuleae.*

TRIBE 1. *Eupatorieae.*

Achenes 5-angled or 5-ribbed. 1. *Hofmeisteria.*

Achenes 10-nerved. 2. *Coleosanthus.*

TRIBE 2. *Astereae.*

Rays present, yellow.

Pappus of several short scales; heads small; slender, suffrutescent plants. 3. *Gutierrezia.*

Pappus of capillary bristles.
Heads solitary, terminating naked peduncles. 5. *Stenotopsis.*
Heads not terminating naked peduncles, seldom solitary. 6. *Ericameria.*
Rays none.
Flowers perfect, yellow.
Pappus white or yellowish.
Pappus-bristles all slender.
Involucral bracts not in distinct vertical ranks; herbage resinous-punctate. 6. *Ericameria.*
Involucral bracts in distinct vertical ranks; only the first two species resinous-punctate. 7. *Chrysothamnus.*
Pappus-bristles, at least some, with flattened tips. 4. *Acamptopappus.*
Pappus tawny; bracts well-imbricated, squamose. 8. *Hazardia.*
Flowers dioecious, whitish. 9. *Baccharis.*

TRIBE 3. *Inuleae.*

Willow-like shrub, with silvery appressed pubescence. 10. *Pluchea.*

TRIBE 4. *Heliantheae.*

Pappus of plumose-bristles, rays none. 11. *Bebbia.*
Pappus of scales; rays present or none.
Disk-achenes thick, 4- or 5-angled, not winged. 12. *Viguiera.*
Disk-achenes flattened, the acute angles ciliate or winged. 13. *Encelia.*

TRIBE 5. *Anthemideae.*

Spinescent undershrub; achenes and flowers cobwebby. 14. *Picrothamnus.*
Not spinescent; achenes and flowers not cobwebby. 15. *Artemisia.*

TRIBE 6. *Senecioneae.*

Involucral bracts in 3 or 4 series, imbricated; leaves scale-like. 16. *Lepidospartum.*
Involucral bracts in 1 or 2 series.
Bracts of the involucre many, linear to subulate.
Heads discoid. 17. *Peucephyllum.*
Heads radiate. 19. *Senecio.*
Bracts of the involucre 4–6, broad and obtuse. 18. *Tetradymia.*

1. HOFMEISTERIA.

1. HOFMEISTERIA PLURISETA A. Gray, Pacif. R. Rep. 4: 96, *pl. 9.* 1857.

Type locality: "In a canyon at Bill William's fork, northern Arizona."

Distribution: Rocky places through the Mohave and the Colorado Deserts of southern California, eastward to Arizona and southern Utah. Lower Sonoran.

Specimens examined: Palm Springs, *Parish 4122;* Camp Cady, *Hall 6130.*

2. COLEOSANTHUS.

Heads campanulate, terminating corymbose branchlets.
Leaves ovate, rounded or cordate at base.
Herbage scabrous-atomiferous, green. 1. *C. atractyloides.*
Herbage white-tomentose. 2. *C. incanus.*
Leaves linear to oblong or obovate, narrowed at base.
Inner involucral bracts acuminate; leaves 15–30 mm. long. 3. *C. linifolius.*
Inner involucral bracts merely acutish; leaves 5–15 mm. long. 4. *C. frutescens.*
Heads turbinate, paniculate or glomerate.
Herbage white-tomentose; involucral bracts acute. 5. *C. Nevinii.*
Herbage greenish (except 7); involucral bracts acute.
Leaves ovate; heads 10–15-flowered.
Involucre 10–12 mm. high. 6. *C. californicus.*
Involucre 7–8 mm. high. 7. *C. desetorum.*
Leaves lanceolate; heads 5-flowered. 8. *C. Knappianus.*

1. COLEOSANTHUS ATRACTYLOIDES (A. Gray) Kuntze, Rev. Gen. Pl. **1**: 328. 1891.

Brickellia atractyloides A. Gray, Proc. Am. Acad. **8**: 290. 1870.

Type locality: "Utah, near the Rio Colorado."

Distribution: The Mohave and Colorado Deserts of southern California, eastward to Arizona and southern Nevada. Lower Sonoran.

Specimens examined: Near Palm Springs, *S. B. & W. F. Parish 1210;* northern base of the San Bernardino Mountains, *Parish 3710;* Cushenberry Spring, *Parish 2387;* Colorado Desert, *Brandegee*, 1901; no locality, *Parry & Lemmon 158;* Rabbit Springs, *Parish 4875;* Providence Mountains, *Brandegee*, May 27, 1902.

2. COLEOSANTHUS INCANUS (A. Gray) Kuntze, Rev. Gen. Pl. **1**: 328. 1891.

Brickellia incana A. Gray, Proc. Am. Acad. **7**: 350. 1868.

Type locality: "Providence Mountain, in the Mohave district."

Distribution: In dry washes of the Mohave Desert, eastward to southern Nevada. Lower Sonoran.

Specimens examined: Providence Mountains, *Cooper*, 1860–61; dry washes near Mohave River, *S. B. & W. F. Parish 1248;* Cushenberry Springs, *Parish 2388.*

3. Coleosanthus linifolius (Eaton) Kuntze, Rev. Gen. Pl. **1**: 328. 1891.

Brickellia linifolia Eaton, Bot. King. Exp. 137, *pl. 15, fig. 1–6.* 1871.

Brickellia mohavensis A. Gray, Syn. Fl. **1**, pt. 2: 104. 1884.

Type locality: "Sandy bottoms of American Fork, Jordan Valley, Utah."

Distribution: Gravelly places in the Mohave and Colorado Deserts, eastward to Arizona and Colorado. Lower Sonoran.

Specimens examined: Cactus Flat, Cushenberry Canyon, north slope of the San Bernardino Mountains, *Parish 3111;* eastern base of San Jacinto Mountain, *Hall 2142*; Providence Mountains, *Brandegee*, May 26, 1902.

4. Coleosanthus frutescens (A. Gray) Kuntze, Rev. Gen. Pl. **1**: 328. 1891.

Brickellia frutescens A. Gray, Proc. Am. Acad. **17**: 207. 1882.

Type locality: "Mountain Springs, San Diego Co."

Distribution: Dry gravelly ridges on the desert slope of the Cuiamaca Mountains, southward into adjacent Lower California. Lower Sonoran.

Specimens examined: Jacumba Hot Spring, *Abrams 3665.*

5. Coleosanthus Nevinii (A. Gray) Heller, Cat. N. Am. Pl. 8. 1898.

Brickellia Nevinii A. Gray, Proc. Am. Acad. **20**: 297. 1884.

Type locality: "Los Angeles Co., California, near Newhall."

Distribution: Mountains of Ventura County, southward to the southern slopes of the San Gabriel Mountains. Upper Sonoran.

Specimens examined: Hot Springs Canyon, Ventura County, *Abrams & McGregor 192;* San Antonio Canyon, *Baker 3731;* near Sherman, *Braunton 17; Greata 331.*

6. Coleosanthus californicus (Torr. & Gray) Kuntze, Rev. Gen. Pl. **1**: 328. 1891.

Bulbostylis californica Torr. & Gray, Fl. N. Am. **2**: 79. 1840.

Brickellia californica (Torr. & Gray) A. Gray, Pl. Fendl. 64. 1849.

Type locality: "California." First collected by Douglas.

Distribution: Mendocino County and the foothills of the Sierra Nevada, southward to northern Lower California. In southern California this species is common on the coastal slope, growing in washes and on dry ridges in the chaparral. Upper Sonoran.

Specimens examined: Santa Barbara, *Elmer 4189;* Arroyo Seco, near Pasadena, *Grinnell*, Nov. 14, 1903; Elysian Park, Los Angeles, *Abrams 4173;* San Antonio Canyon, San Gabriel Mountains, *Baker 3696;* foothills of the San Bernardino Mountains, *S. B. & W. F. Parish 566;* San Diego, *Cleveland*, 1874; Santiago Canyon, Santa Ana Mountains, *Helen D. Geis 523;* Campo, *Palmer 171.*

7. COLEOSANTHUS DESETORUM Coville, Cont. Nat. Herb. **4**: 119. 1893.

Brickellia desetorum Coville, Proc. Biol. Soc. Wash. **7**: 68. 1892.
Brickellia californica desetorum (Coville) Hall, Univ. Calif. Pub. Bot. **3**: 33. 1907.

Type locality: "Between Banning and Seven Palms, on the Southern Pacific Railroad, California."

Distribution: Growing in canyons on the desert slopes along the Colorado and Mohave deserts. Lower Sonoran.

Specimens examined: Dos Cabesas, *Orcutt*, Nov. 1, 1890.

8. COLEOSANTHUS KNAPPIANUS (Drew) Greene, Erythea **1**: 54. 1893.

Brickellia Knappiana Drew, Pittonia **1**: 260. 1888.

Type locality: "In the neighborhood of the Mohave River."

Distribution: In the more eastern and northern part of the Mohave Desert, perhaps not within our range. Lower Sonoran.

Specimens examined: Pleasant Canyon, Panamint Mountains, *Hall & Chandler 6919.*

3. GUTIERREZIA.

Flowers of ray and disk 1–2 each. 1. *G. lucida.*
Flowers of ray and disk several each.
    Ultimate branchlets ascending, destitute of bract-like leaves. 2. *G. divergens.*
    Ultimate branchlets strictly divaricate, clothed with very short bract-like leaves. 3. *G. bracteata.*

These species are scarcely more than suffrutescent, and probably could be excluded with equal propriety.

1. Gutierrezia lucida Greene, Fl. Franc. 361. 1897.

Xanthocephalum lucidum Greene, Pittonia **2**: 282. 1892.

Type locality: "In the region of the Mohave Desert, and southward."

Distribution: Dry gravelly hillsides in the Mohave Desert. Lower Sonoran.

Specimens examined: Between Mohave and Rosemond, *Abrams & McGregor 506.*

2. Gutierrezia divergens Greene, Pittonia **4**: 58. 1899.

Type locality: "San Bernardino mesas."

Distribution: Dry mesas and foothills in the coastal region of southern California. Upper and Lower Sonoran.

Specimens examined: Los Angeles, *Nevin*, 1879; *Brandegee;* San Gabriel Canyon, *Abrams 2720;* Los Angeles, *Gambel;* Tia Juana, *Herre*, Aug. 8, 1902; vicinity of San Bernardino, *Parish 5151;* El Toro, *Abrams 1858;* Santiago Canyon, Santa Ana Mountains, *Helen D. Geis 573;* Alpine, San Diego County, *Mearns 3997.*

3. Gutierrezia bracteata Abrams, Bull. Torrey Club **34**: 265. 1907.

Gutierrezia californica bracteata Hall, Univ. Calif. Pub. Bot. **3**: 36. 1907.

Gutierrezia laricina Greene, Rep. Nov. Spec. **7**: 195. 1909.

Type locality: "Desert slopes of San Bernardino County, between Banning and Seven Palms."

Distribution: Dry sandy soil on the western border of the Colorado Desert. Lower Sonoran.

Specimens examined: Between Banning and Seven Palms, *Orcutt*, Nov. 1889.

4. ACAMTOPAPPUS.

1. Acamtopappus sphaerocephalus Harv. & Gray; A. Gray, Pl. Fendl. 76. 1849.

Type locality: "California." First collected by Coulter.

Distribution: In the covillea belt of the Colorado and Mohave Deserts, eastward to Arizona and southern Utah. Lower Sonoran.

Specimens examined: Mohave Desert, *Pringle*, May 24, 1882; San Felipe, *Antisell;* Lancaster, *Elmer 3621;* eastern base of San Jacinto Mountain, *Hall 2108;* Barstow Hills, *Hall 6159;* Palmdale, *Abrams & McGregor 513;* Willow Springs, *Abrams & McGregor 423*.

5. STENOTOPSIS.

Leaves thin, mostly 4–5 cm. long; involucral bracts over 1 cm. long; achenes 5 mm. long. 1. *S. linearifolius*.

Leaves coriaceous, glutinous, less than 2 mm. long; involucral bracts less than 1 cm. long; achenes 3.5 mm. long. 2. *S. interior*.

1. Stenotopsis linearifolius (DC.) Rydb. Bull. Torrey Club **27**: 617. 1900.

Aplopappus linearifolius DC. Prod. **5**: 347. 1836.

Stenotus linearifolius Torr. & Gray, Fl. N. Am. **2**: 238. 1842.

Type locality: "In California."

Distribution: Foothills of the Coast Ranges from Sonoma County, southward to northern Lower California, and also on the western slope of the Sierra Nevada (Marysville Buttes, *Heller 5558*). Upper Sonoran.

Specimens examined: Cajon Pass, *Orcutt*, 1883; vicinity of San Bernardino, *Wright*, 1881; Coahuilla Hills, Riverside County, altitude 900 meters, *Hall 2902;* Potrero, *Abrams 3549*.

2. Stenotopsis interior (Coville) Rydb. Bull. Torrey Club **27**: 617. 1900.

Aplopappus interior Coville, Proc. Biol. Soc. Wash. **7**: 65. 1892.

Stenotus interior Greene, Erythea **2**: 72. 1894.

Stenotus linearifolius interior Hall, Univ. Calif. Pub. Bot. **3**: 48. 1907.

Type locality: "About 4 miles southeast from Mill Canyon Divide, at the northern edge of the Darwin Mesa, Inyo County, California."

Distribution: On the western borders of the Mohave and Colorado Deserts, eastward to Arizona and southern Utah. Lower Sonoran.

Specimens examined: Mountains Springs, *Vasey 260;* Jacumba Hot Spring, *Abrams 3647;* Mount Pinos, *Elmer 3993;* near Cuddy's ranch, Ventura County, *Dudley 4506;* Seymons Creek, Mount Pinos, *Hall 6498;* Soldiers' Camp near Fort Tejon, *Abrams & McGregor 276.*

6. ERICAMERIA.

Leaves glabrous, glandular-punctate; style-appendages filiform-subulate.
  Leaves not filiform.
    Leaves obovate or oblanceolate; low, spreading shrub; branches 1–2 dm. long. 1. *E. cuneata spathulata.*
    Leaves flat, linear-lanceolate; erect shrub, 1–3 m. high. 2. *E. Parishii.*
  Leaves filiform.
    Rays wanting.
      Inflorescence cymose. 3. *E. arborescens.*
      Inflorescence paniculate. 4. *E. brachylepis.*
    Rays present.
      Achenes pubescent.
        Outer involucral bracts obtuse. 5. *E. Palmeri.*
        Outer involucral bracts acuminate. 6. *E. pinifolia.*
      Achenes glabrous; outer involucral bracts acute. 7. *E. ericoides.*
Leaves minutely pubescent, often obscurely glandular-punctate; style-appendages oblong-ovate. 8. *E. monactis.*

1. **Ericameria cuneata spathulata** (A. Gray) Hall, Univ. Calif. Pub. Bot. **3**: 52. 1907.

Bigelovia spathulata A. Gray, Proc. Am. Acad. **11**: 74. 1876.
Bigelovia rupestris Greene, Bot. Gaz. **6**: 183. 1881.
Chrysoma cuneata spathulata Greene, Erythea **3**: 11. 1895.
Chrysoma Merriami Eastw. Bull. Torrey. Club **32**: 214. 1905.

Type locality: "Near the entrance of the Tantillas Great Canyon, in Lower California, near the borders of the State."

Distribution: On rocky ledges from the San Gabriel Mountains southward into northern Lower California. Upper Sonoran.

Specimens examined: Cucamongo Mountains, *S. B. & W. F. Parish 1027;* San Gabriel Canyon, *Abrams 853;* Hines Peak, Topatopa Mountains, *Abrams & McGregor 85.* (Closely resembling the typical form, but not in bloom, and therefore placed here doubtfully.)

2. **Ericameria Parishii** (Greene) Hall, Univ. Calif. Pub. Bot. **3**: 55. 1907.

Bigelovia Parishii Greene, Bull. Torrey Club **9**: 62. 1882.
Chrysoma Parishii Greene, Erythea **3**: 10. 1895.

Aster Parishii Kuntze, Rev. Gen. Pl. **1**: 318. 1891.

Type locality: "San Bernardino Mountains, California."

Distribution: Western slope of the San Gabriel Mountains, southward to northern Lower California. Upper Sonoran.

Specimens examined: San Bernardino Mountains, 450–750 meters altitude, *S. B. & W. F. Parish 571;* canyons of the San Bernardino Mountains, *Parish*, Sept., 1900; San Gabriel Canyon, altitude 750 meters, *Abrams 850;* Waterman Canyon, *Parish 4584;* Lytle Creek, altitude 650 meters, *Abrams 1961;* San Felipe, *Susan G. Stokes*, July, 1895; Cuiamaca Mountains, altitude 1200 meters, *Susan G. Stokes*, June 20, 1895.

3. ERICAMERIA ARBORESCENS (A. Gray) Greene, Man. Bay Reg. 175. 1894.

Linosyris arborescens A. Gray, Bot. Mex. Bound. 79. 1859.
Chrysoma arborescens Greene, Erythea **3**: 10. 1895.
Bigelovia arborescens A. Gray, Proc. Am. Acad. **8**: 638. 1873.

Type locality: "California."

Distribution: In the Coast Ranges and Sierra Nevada of central California, extending southward to the Santa Ynez Mountains. Upper Sonoran.

Specimens examined: La Cumbre Peak, Santa Ynez Mountains, *Abrams 4317*.

4. ERICAMERIA BRACHYLEPIS (A. Gray) Hall, Univ. Calif. Pub. Bot. 3: 56. 1907.

Bigelovia brachylepis A. Gray, Bot. Calif. **1**: 614. 1876.
Chrysoma brachylepis Greene, Erythea **3**: 12. 1895.

Type locality: "Larken's Station, 80 miles east by north of San Diego."

Distribution: Along the southern border of San Diego County, and extending southward into adjacent Lower California. Lower and Upper Sonoran.

Specimens examined: Larken's Station, *Palmer*, 1875 (type); Potrero, *Cleveland*, 1876.

5. ERICAMERIA PALMERI (A. Gray) Hall, Univ. Calif. Pub. Bot. 3: 53. 1907.

Aplopappus Palmeri A. Gray, Proc. Am. Acad. **11**: 74. 1876.
Chrysoma Palmeri Greene, Erythea **3**: 12. 1895.

Aster Nevinii Kuntze, Rev. Gen. Pl. **1**: 316. 1891.

Type locality: "Tecate Mountains, Lower California, twenty or thirty miles below the state boundary."

Distribution: On dry sandy plains and foothills of the coastal slope of southern California, extending southward into northern Lower California. Upper and Lower Sonoran.

Specimens examined: San Gorgonio Pass, *Parry;* mesas about San Bernardino, *S. B. & W. F. Parish 654; Parish 5127;* Inglewood, *Abrams 4201.*

6. ERICAMERIA PINIFOLIA (A. Gray) Hall, Univ. Calif. Pub. Bot. **3**: 54. 1907.

Aplopappus pinifolius A. Gray, Proc. Am. Acad. **8**: 636. 1873.
Chrysoma pinifolia Greene, Erythea **3**: 12. 1895.
Aster pityphyllus Kuntze, Rev. Gen. Pl. **1**: 316. 1891.

Type locality: "Near Los Angeles, in dry river-beds."

Distribution: On the dry plains and foothills from the vicinity of Los Angeles, southward to the southern boundary of the State. Upper and Lower Sonoran.

Specimens examined: Los Angeles, *Bolander*, 1873 (type); *Nevin*, 1879; vicinity of San Bernardino, *Parish 4202; Wright*, 1880; Lytle Creek Canyon, *Abrams 2744;* vicinity of San Bernardino, *Parish 5130* (in part—the leafless branch is *Lepidospartum squamatum*); Big Tejunga wash, *Abrams 1372;* Potrero, *Susan G. Stokes*, July 14, 1895; Cajon Pass, *Abrams & McGregor 696;* near Julian, *Orcutt*, Oct., 1889; Soledad Pass, *Pringle*, Oct. 21, 1882.

7. ERICAMERIA ERICOIDES (Less.) Jepson, Fl. W. Mid. Calif. 559. 1901.

Diplopappus ericoides Less. Linnaea **6**: 117. 1831.
Aplopappus ericoides Hook. & Arn. Bot. Beech. 146. 1833.
Ericameria microphylla Nutt. Trans. Am. Phil. Soc. II. **7**: 329. 1840.
Chrysoma ericoides Greene, Erythea **3**: 11. 1895.
Aster ericinus Kuntze, Rev. Gen. Pl. **1**: 313. 1891.

Type locality: "Cel. de Chamisso in California," probably at San Francisco.

Distribution: Sand-dunes along the coast from central California south to Los Angeles County. Upper Sonoran.

Specimens examined: Playa del Rey, *Abrams 199.*

8. **Ericameria monactis** (A. Gray) McClatchie, Erythea **2**: 124. 1894.

Aplopappus monactis A. Gray, Proc. Am. Acad. **19**: 1. 1883.
Acamptopappus microcephalus Jones, Contr. W. Bot. no. 8: 33. 1898.
Tumionella monactis Greene, Leaflets **1**: 173. 1906.
Chrysothamnus corymbosus Elmer, Bot. Gaz. **39**: 50. 1905.

Type locality: "Borders of the Mohave Desert, S. E. California."

Distribution: Mohave Desert from Owens Valley south to Cajon Pass. This species has also been reported as occurring on the coastal slope in the vicinity of West Riverside. Lower Sonoran.

Specimens examined: Mohave River, *Palmer 199* (type); head of Cajon Pass, *S. B. & W. F. Parish 905;* north slopes of San Bernardino Mountains, *S. B. & W. F. Parish 1246;* Mohave Desert, *Pringle*, May, 1882; Lancaster, *Elmer 3668;* near Sprague's Ranch, Liebre Mountains, *Dudley 4370;* near Barstow, *Hall 6169;* Willow Springs, Antelope Valley, *Abrams & McGregor 419.*

7. CHRYSOTHAMNUS.

Leaves resinous-punctate, terete.
  Outer involucral-bract with a distinct greenish subapical spot. 1. *C. teretifolius.*
  Outer involucral bracts pale, without greenish spot. 2. *C. paniculatus.*
Leaves not resinous-punctate, plane or canaliculate.
  Branches not tomentose; leaves glabrous except on the margins.
    Stems glutinous; leaves not ciliate, often sparse. 3. *C. mohavensis.*
    Stems not glutinous, leafy; leaves short-ciliate on the margins. 4. *C. stenophyllus.*
  Branches more or less tomentose.
    Heads 5-flowered.
      Bracts abruptly contracted to a spreading setiform tip. 5. *C. ceruminosus.*
      Bracts acute or acuminate. 6. *C. occidentalis.*
    Heads 9-flowered; a few of the outer bracts foliaceous. 7. *C. Parryi.*

1. **Chrysothamnus teretifolius** (Dur. & Hilg.) Hall, Univ. Calif. Pub. Bot. **3**: 57. 1907.

Linosyris teretifolia Dur. & Hilg. Pacif. R. Rep. **5**: 9, *pl. 7.* 1855.
Bigelovia teretifolia A. Gray, Proc. Am. Acad. **8**: 644. 1873.

Chrysoma teretifolia Greene, Erythea **3**: 12. 1895.

Type locality: "All over the mountains around Tejon Valley."

Distribution: On the desert slopes of the mountains of southern California from Tejon Pass southward to the Cuiamaca Mountains (according to Gray), and eastward to southern Nevada. Lower Sonoran.

Specimens examined: Mountains around Tejon Valley, *Heerman* (type); Morongo Pass, *Parry;* San Gorgonio Pass, *S. B. & W. F. Parish 655;* hills bordering the Mohave Desert, *Pringle*, Oct. 21, 1882.

2. CHRYSOTHAMNUS PANICULATUS (A. Gray) Hall, Univ. Calif. Pub. Bot. **3**: 58. 1907.

Linosyris viscidiflora paniculata A. Gray, Bot. Mex. Bound. 80. 1859.

Bigelovia paniculata A. Gray, Proc. Am. Acad. **8**: 644. 1873.

Chrysoma paniculata Greene, Erythea **3**: 12. 1895.

Type locality: "California, Schott, probably in the southeastern part of the State: the station not recorded."

Distribution: On the Mohave and the Colorado Deserts of southern California, and extending into Arizona and southern Nevada. Lower Sonoran.

Specimens examined: California, locality not given, *Schott* (type); desert mountains, station not given, *S. B. & W. F. Parish 651;* desert washes, *Parry*, 1875; Whitewater, *S. B. & W. F. Parish 655;* Larken's Station (Jacumba Hot Spring), *Palmer*, 1875.

3. CHRYSOTHAMNUS MOHAVENSIS Greene, Erythea **3**: 113. 1895.

Bigelovia mohavensis Greene, A. Gray, Syn. Fl. **1**, pt. 2: 138. 1884.

Aster mohavensis Kuntze, Rev. Gen. Pl. **1**: 318. 1891.

Type locality: "On the Mohave Desert."

Distribution: Mohave Desert, from the Tehachapi Mountains southward to the desert slopes of the San Bernardino Mountains. Lower Sonoran.

Specimens examined: Tehachapi Pass, *Eastwood*, Sept. 1894; Mohave Desert, *Pringle*, Oct., 1882; Fort Tejon, *Rothrock 271;* San Bernardino Mountains, *S. B. & W. F. Parish 1072;* Cushenberry Springs, north slope of San Bernardino Mountains, *Abrams 2145;* Rock Creek, *Abrams & McGregor 625*.

4. CHRYSOTHAMNUS STENOPHYLLUS (A. Gray) Greene, Erythea **3**: 94. 1895.

Bigelovia Douglasii stenophylla A. Gray, Proc. Am. Acad. **8**: 646. 1873.

Chrysothamnus viscidiflorus stenophyllus Hall, Univ. Calif. Pub. Bot. **3**: 59. 1907.

Type locality: "Northwestern Nevada."

Distribution: Western Nevada and the eastern slope of the Sierra Nevada, southward to the San Bernardino Mountains. In the more arid parts of the Transition Zone.

Specimens examined: Bear Valley, San Bernardino Mountains, *S. B. & W. F. Parish 1454; Abrams 2133, 2889.*

5. CHRYSOTHAMNUS CERUMINOSUS (Dur. & Hilg.) Greene, Erythea **3**: 94. 1895.

Linosyris ceruminosa Dur. & Hilg. Pacif. R. Rep. **5**, pt. 3: 9, *pl. 6.* 1855.

Bigelovia ceruminosa A. Gray, Proc. Am. Acad. **8**: 643. 1873.

Type locality: "Tejon Pass."

Distribution: This species was collected by Dr. Heerman, of the Pacific Railway Survey, in the region of Tejon Pass, but has never been rediscovered.

6. CHRYSOTHAMNUS OCCIDENTALIS Greene, Fl. Fran. 369. 1897.

Chrysothamnus californicus occidentalis Greene, Erythea **3**: 112. 1895.

Chrysothamnus nauseosus occidentalis Hall, Univ. Calif. Pub. Bot. **3**: 60. 1907.

Type locality: "In the Coast Ranges from Humboldt County southward." Later (Fl. Fran.) Greene gives the range as "Kern and Santa Barbara counties."

Distribution: Mountains of Santa Barbara County and southern Kern County, southward to the San Jacinto Mountains. Transition.

Specimens examined: Green Valley, *Shaw & Illingsworth 55.*

7. CHRYSOTHAMNUS PARRYI (A. Gray) Greene, Erythea **3**: 113. 1895.

Linosyris Parryi A. Gray, Proc. Philad. Acad. **1863**: 63. 1863.

Bigelovia Parryi A. Gray, Proc. Am. Acad. **8**: 642. 1873.

Type locality: "Rocky Mountains of Colorado in the region of South and Middle Park," according to Gray (Proc. Am. Acad. **8**: 642).

Distribution: A Rocky Mountain species of rather high altitudes which occurs on Alamo Mountain, altitude 2100 meters, eastern Ventura County, according to Hall (Univ. Calif. Pub. Bot. **3**: 62. 1907).

8. HAZARDIA.

1. Hazardia squarrosa (Hook. & Arn.) Greene, Erythea **2**: 112. 1894.

Aplopappus squarrosus Hook. & Arn. Bot. Beechey 146. 1833.

Type locality: Probably Monterey. "Collected at San Francisco, and a few at Monterey Bay" is the general locality given at the head of the list of plants in which this species appears.

Distribution: Monterey, southward to San Diego, and on the islands off the coast of southern California. Upper Sonoran.

Specimens examined: Mountain Drive, near Santa Barbara, *Eastwood 201; Abrams 4147;* Los Angeles, *Hasse*, Oct., 1887; Elysian Park, *Abrams 4180;* San Antonio Canyon, *Baker 3732;* San Diego, *Brandegee*, Sept. 13, 1902 (*Baker 3426*); San Ysabel, *Hayes 395*.

9. BACCHARIS.

Achenes 10-nerved; leaves not willow-like.
Pappus of fertile flowers conspicuously elongating in fruit, flaccid.
Leaves except some of the uppermost not linear.
Leaves obovate, sessile; pappus, in fruit, about 8 mm. long. 1. *B. pilularis.*
Leaves of branches oblanceolate or oblong, those of the branchlets linear; heads somewhat nakedly paniculate. 2. *B. Emoryi.*
Leaves all linear, rigid, those of the strongly striated branchlets sparse and minute; involucre of male flowers 3–4 mm. long. 3. *B. sarothroides.*
Pappus of fertile flowers rather rigid and scanty, not elongated in age; branches broom-like. 4. *B. sergiloides.*
Achenes 5-nerved or rarely 4-nerved.
Leaves willow-like, glabrous and sometimes glutinous.
Involucre 5–6 mm. long; bracts stramineous. 5. *B. glutinosa.*
Involucres 8 mm. long; bracts tawny. 6. *B. viminea.*
Leaves pubescent, linear-oblong, obtuse, acutely serrate. 7. *B. Plummerae.*

1. Baccharis pilularis DC. Prod. **5**: 407. 1836.

Baccharis consanguinea DC. Prod. **5**: 408. 1836.

Type locality: "In California." First collected by Douglas.

Distribution: Coastal region of Oregon, southward to Santa Monica, southern California. In southern California this species is local at Santa Monica, but is more frequent in the coastal region of Santa Barbara and Ventura Counties. Upper Sonoran.

Specimens examined: Santa Catalina Island, *Blanche Trask*, Sept., 1897; Santa Barbara, *Abrams*, Aug., 1909.

2. Baccharis Emoryi A. Gray, Bot. Mex. Bound. 83. 1859.

Type locality: "Very common on the Gila; *Emory*, coll. in 1846, etc. Fort Yuma, E. California; Major Thomas." Emory's specimen in the Gray Herbarium is a mere fragment, and the original description, at least of the pistillate plant was undoubtedly drawn from Thomas' plant.

Distribution: Western Arizona and southern Utah, westward to the coastal region of southern California. Upper and Lower Sonoran.

Specimens examined: Near Los Angeles, *Nevin*, 1880; San Bernardino Valley, *S. B. & W. F. Parish 613; Parish 5163*, and Nov., 1902; San Luis Rey, *Parry*, 1850; Potrero, *Cleveland*, 1876; Fallbrook, *Orcutt*, Nov., 1883; near Imperial, *G. D. Abrams*, Jan., 1902; near Santa Ana, *Helen D. Geis 548*.

3. Baccharis sarothroides A. Gray, Proc. Am. Acad. **17**: 211. 1882.

Type locality: "Southern borders of California, San Diego Co., near the old Mission Station, the boundary monuments, etc."

Distribution: In the extreme southern part of the State and adjacent Lower California, eastward to Arizona. Lower Sonoran.

Specimens examined: Boundary monument, near San Diego, *Palmer 265;* Mission Valley, *Orcutt*, Oct., 1883; near San Diego *Hayes*, Oct. 14, 1858; San Felipe Canyon, *Palmer*, 1875; Chula, Vista, *Abrams 4192;* Jacumba Hot Spring, *Abrams 3670*.

4. Baccharis sergiloides A. Gray, Torr. Bot. Mex. Bound. 83. 1859.

Type locality: "Along the Gila or Colorado, dry arroyos, 50 miles west of the Colorado," also in the "southern part of California."

Distribution: From the western part of the Colorado and the Mohave Deserts, eastward to southern Utah. Lower Sonoran.

Specimens examined: Palm Springs, *S. B. & W. F. Parish 296.*

5. Baccharis glutinosa Pers. Syn. **2**: 425. 1807.

Type locality: "An R[egni] Chilensis ruderatis."

Distribution: Along watercourses in the Colorado Desert, extending eastward to Arizona and southern Colorado, and southward into Mexico and Chili. This species has been reported from the coastal region near Los Angeles, but perhaps erroneously. Lower Sonoran.

Specimens examined: Imperial Valley, near Calexico, *Abrams 4004, 4093.*

6. Baccharis viminea DC. Prod. **5**: 400. 1836.

Type locality: "In California." First collected by Douglas.

Distribution: Common along watercourses and in moist places in southern California on the coastal slope; extending from the Sacramento Valley southward to northern Lower California. Upper and Lower Sonoran.

Specimens examined: Los Angeles, *Brewer 171; Grant 97;* San Bernardino Valley, *S. B. & W. F. Parish 702;* Sweetwater Valley, *Deane*, April 8, 1888; San Diego River, *Abrams 3380;* Acton, *Elmer 3701;* vicinity of San Bernardino, *Parish 5014;* Big Tejunga wash, San Fernando Valley, *Abrams 1393;* Tia Juana River, *Herre*, Aug. 8, 1902; Monrovia, *Dudley*, Nov. 25, 1907; Los Angeles, *Grant 97;* Rock Creek, San Gabriel Mountains, *Abrams & McGregor 557.*

7. Baccharis Plummerae A. Gray, Proc. Am. Acad. **15**: 48. 1880.

Type locality: "Along a stream in Glen Loch ravine, in the mountains near Sta. Barbara, California."

Distribution: Santa Ynez Mountains northward to Santa Monica. Originally described as herbaceous, but distinctly woody, forming rounded bushes, about 1 meter high. Upper Sonoran.

Specimens examined: La Cumbre trail, Santa Ynez Mountains, *Abrams 4307*.

10. PLUCHEA.

1. Pluchea sericea (Nutt.) Coville, Cont. Nat. Herb. **4**: 128. 1893.

Polypappus sericeus Nutt. Journ. Acad. Philad. II. **1**: 178. 1847.
Tessaria borealis DC.; Torr. & Gray in Emory, Notes Mil. Reconnois. 143. 1848, without description.
Tessaria borealis A. Gray, Pl. Wright. **1**: 102. 1852.
Pluchea borealis A. Gray, Proc. Am. Acad. **17**: 212. 1882.

Type locality: "Rocky Mountains of Upper California."

Distribution: Along watercourses, extending from Santa Barbara County southward into Lower California, and eastward through the Mohave and Colorado Deserts to the Rio Grande. This species, which is commonly called "arrow-weed," is very common along ditches in the Imperial Valley. Lower Sonoran.

Specimens examined: Santa Clara Valley, Ventura County, *Rothrock 184;* San Diego, *Palmer*, 1875; Mohave Desert, *Brandegee;* Calexico, *Abrams 4096;* Tia Juana River, *Abrams 3515;* San Miguel Mountain, *Chandler 5195*.

11. BEBBIA.

Herbage green and glabrous.	1. *B. juncea.*
Herbage scabrous.	1*a*. *B. juncea aspera.*

1. Bebbia juncea (Benth.) Greene, Bull. Calif. Acad. **1**: 180. 1885.

Carphephorus junceus Benth. Bot. Sulph. 21. 1844.

Type locality: "Bay of Magdalena," Lower California.

Distribution: Western base of the San Bernardino Mountains, southward in the coastal region to northern Lower California. Lower Sonoran.

Specimens examined: City Creek wash, near Highlands, *Abrams 2803;* Santiago Canyon, Santa Ana Mountains, *Helen D. Geis*, Dec., 1902; between Grantville and Santee, *Abrams 3755;* Canyon of the San Jacinto River, *Hall 2016;* Santa Ana Canyon, San Bernardino Mountains, *Shaw & Illingsworth*, Aug. 10, 1901.

1*a*. **Bebbia juncea aspera** Greene, Bull. Calif. Acad. **1**: 180. 1885.

Bebbia aspera Nelson, Bot. Gaz. **37**: 273. 1904.

Type locality: "Southeastern borders of California and adjacent Arizona."

Distribution: Common in sandy washes in the Colorado Desert, extending northward through the Mohave Desert, and eastward to southern Nevada and Arizona. Specimens have also been found on the coastal slope in southern California. Lower Sonoran.

Specimens examined: "San Diego," *Brandegee;* Signal Mountain, *Abrams 3161.*

12. VIGUIERA.

Leaves lanceolate; achenes sparsely pubescent.	1. *V. laciniata.*
Leaves ovate; achenes densely villous.	2. *V. Parishii.*

1. **Viguiera laciniata** A. Gray, Bot. Mex. Bound. 89. 1859.

Type locality: "Rancho Gamacho, east of San Diego, Califronia."

Distribution: A common shrub on the mesas and foothills in the southwestern part of San Diego County, extending into adjacent Lower California. Lower Sonoran.

Specimens examined: Rancho Gamacho, east of San Diego, *Schott*, Sept., 1855 (type); near San Diego, *Newberry*; Sweetwater, *Cleveland*, April, 1876; Cottonwood Grade, near Potrero, *Abrams 3901;* San Diego, *Susan G. Stokes*, June 20, 1895; Mission Hills, San Diego, *Abrams 3450.*

2. **Viguiera Parishii** Greene, Bull. Torrey Club **9**: 15. 1882.

Viguiera deltoidea Parishii Rose, Cont. Nat. Herb. **1**: 72. 1890.

Type locality: "San Luis Rey."

Distribution: Western San Diego County, where it is rare, eastward to the Providence Mountains. Upper and Lower Sonoran.

Specimens examined: San Luis Rey, *S. B. & W. F. Parish 963* (type); Palm Springs, *Parish 4126.*

13. ENCELIA.

Peduncles pubescent.	
Rays present.	
Involucre densely villous; disk purple.	1. *E. californica.*

Involucre canescent; disk yellow.	2. *E. actoni.*
Rays none; herbage scabrous.	3. *E. frutescens.*
Peduncles glabrous; leaves silvery tomentose.	4. *E. farinosa.*

1. Encelia californica Nutt. Trans. Am. Phil. Soc. **7**: 357. 1841.

Type locality: "On dry hills, near St. Barbara, Upper California."

Distribution: Common on hillsides from Santa Barbara southward on the coast slope to northern Lower California. Confined mainly to the Upper Sonoran but extending into the Lower Sonoran toward its southern limits.

Specimens examined: Santa Barbara, *Bolander*, 1873; hills near Inglewood, *Abrams 3107;* Santa Monica Canyon, *Abrams 1486;* San Diego, *Susan G. Stokes*, June 12, 1895; Santiago Canyon, Santa Ana Mountains, *Helen D. Geis 540;* Santa Barbara, *Elmer 3899;* hillsides at Tia Juana, *Abrams 3479.*

2. Encelia actoni Elmer, Bot. Gaz. **39**: 47. 1905.

Encelia frutescens f. *actoni* Hall, Univ. Calif. Pub. Bot. **3**: 135. 1907.

Type locality: "Acton, Los Angeles county, California."

Distribution: Western slopes of the Mohave and Colorado Deserts, extending into the coastal region in the vicinity of San Jacinto. Lower Sonoran.

Specimens examined: Acton, *Elmer 3724* (type); Hesperia, *Parish 4873;* San Felipe, *Susan G. Stokes*, July 28, 1895; Ventura, *Brandegee;* Jacumba Hot Spring, *Abrams 3667;* San Jacinto, *Hall 2907;* Liebre Mountains, *Abrams & McGregor 402;* between Tehachapi and Mohave, *Abrams & McGregor 500;* Rock Creek, *Abrams & McGregor 548.*

3. Encelia frutescens A. Gray, Proc. Am. Acad. **8**: 657. 1873.

Simsia frutescens A. Gray, Bot. Mex. Bound. 89. 1859.

Encelia frutescens f. *ovata* Hall, Univ. Calif. Pub. Bot. **3**: 135. 1907.

Type locality: "Sierra Prieta, near Fort Yuma, E. California."

Distribution: Dry hillsides and washes of the Colorado and Mohave Deserts, eastward to Arizona and southern Nevada. Lower Sonoran.

Specimens examined: Signal Mountain, *Abrams 3156*, and Dec. 29, 1907; McCoy wash, Colorado Desert, *Hall 5939*.

4. ENCELIA FARINOSA A. Gray; Torr. in Emory, Notes Mil. Reconnois. 143. 1848.

Type locality: According to Emory's notes (page 103) this species was collected in southern California in the vicinity of Carriso Creek.

Distribution: San Bernardino Valley, southward to northern Lower California and eastward to Arizona. Lower Sonoran.

Specimens examined: Vicinity of San Bernardino, *Parish 4782;* Signal Mountain, *Abrams 3159;* near Mentone, *Abrams & McGregor 823*.

14. PICROTHAMNUS.

1. PICROTHAMNUS DESETORUM Nutt. Trans. Am. Phil. Soc. II. **7**: 417. 1841.

Artemisia spinescens Eaton, Bot. King. Exped. 180, *pl. 19*. 1871.

Type locality: "North sources of the Platte."

Distribution: Mohave Desert of southern California extending northward throughout the Great Basin region. Upper Sonoran.

Specimens examined: I have not seen any specimens within our range.

15. ARTEMISIA. SAGE-BRUSH.

Heads heterogamous; marginal flowers pistillate, the central perfect; leaf-segments filiform. 1. *A. californica.*
Heads homogamous; the flowers all perfect; leaf-segments not filiform.
  Achenes glabrous.
    Involucre oblong, 3–8, or rarely 9-flowered.
      Accessory bracts of the involucre short and ovate. 2. *A. tridentata.*
      Accessory bracts of the involucre oblong or lanceolate. 3. *A. tripartita.*
    Involucre short-campanulate, 9–12-flowered; bracts all ovate or oval, glabrate. 4. *A. Rothrockii.*
  Achenes pubescent. 5. *A. Parishii.*

1. ARTEMISIA CALIFORNICA Less. Linnaea **6**: 523. 1831.

Artemisia abrotanoides Nutt. Trans. Am. Phil. Soc. II. **7**: 399. 1841.

Artemisia foliosa Nutt. Trans. Am. Phil. Soc. II. **7**: 397. 1841.
Type locality: "De Chamisso in California."

Distribution: San Francisco Bay, southward through the Coast Ranges to Lower California. Upper Sonoran.

Specimens examined: Sierra Santa Monica, *Brewer 53;* sandy plains near Colton, *Pringle*, Oct. 22, 1882; San Luis Rey, *Parry;* Santa Barbara, *Elmer 3964;* near Oneonta, *Herre*, Aug. 8, 1902.

2. **ARTEMISIA TRIDENTATA** Nutt. Trans. Am. Phil. Soc. II. **7**: 398. 1841.

Type locality: "Hab. Plains of the Oregon, and Lewis River."

Distribution: Eastern Washington, eastward throughout the arid regions of the Rocky Mountains, and southward to Lower California. In southern California it is common on the desert slopes of the mountains in, and just below, the yellow pine belt. Arid Transition and Upper Sonoran.

Specimens examined: Holcomb Valley, San Bernardino Mountains, *Shaw & Illingsworth 211.*

3. **ARTEMISIA TRIPARTITA** Rydb. Mem. N. Y. Bot. Gard. **1**: 432. 1900.

Artemisia trifida Nutt. Trans. Am. Phil. Soc. II. **7**: 398. 1841. Not Turcz. 1832.

Type locality: "Placers of the Rocky Mountains and Oregon."

Distribution: Mohave Desert, extending eastward and northward through the Great Basin region. Upper and Lower Sonoran.

Specimens examined: I have not seen any specimens from southern California.

4. **ARTEMISIA ROTHROCKII** A. Gray, Bot. Calif. **1**: 618. 1876.

Type locality: "Sierras of Tulare Co., Olanche Mountains and Monachay Meadows, at 8,000 to 9,300 feet."

Distribution: Southern Sierra Nevada, south to the San Bernardino Mountains, and east to southern Utah. Arid Transition and Upper Sonoran.

Specimens examined: I have not seen any specimens from southern California.

5. Artemisia Parishii A. Gray, Proc. Am. Acad. **17**: 220. 1882.

Type locality: "Newhall, Los Angeles Co., and in Cajon Pass, California." According to Parish (Zoe **5**: 120), "the second station 'Cajon Pass' given in the original description is an error. The plant has been found, as yet, only at Newhall."

Distribution: A common plant in the vicinity of Newhall and in Antelope Valley often forming large shrubs 2 meters high or more. Much of this material has been mistaken heretofore for *Artemisia tridenta angustifolia* A. Gray, with which it is closely related if not identical.

Specimens examined: Newhall, *S. B. & W. F. Parish 1065; Helen D. Geis;* near Lancaster, *Wells*, Dec., 1909; near Burbank, *Braunton 907.*

16. LEPIDOSPARTUM.

1. Lepidospartum squamatum A. Gray, Proc. Am. Acad. **19**: 50. 1883.

Linosyris squamata A. Gray, Proc. Am. Acad. **8**: 290. 1870.

Linosyris squamata Breweri A. Gray, Proc. Am. Acad. **8**: 290. 1870.

Linosyris squamata Palmeri A. Gray, Proc. Am. Acad. **8**: 290. 1870.

Tetradymia squamata A. Gray, Proc. Am. Acad. **9**: 207. 1874.

Type locality: "Low hills of the Sierra Santa Monica, Los Angeles Co., Californica." When Dr. Gray first published his diagnosis of this species he had only two specimens in his herbarium. One of these, collected by Brewer on "low hills of the Sierra Santa Monica, Los Angeles Co., California," was placed in the variety *Breweri;* the other, collected on the "desert of the Colorado, Arizona, 1870 [by] Dr. E. Palmer," became his second variety, *Palmeri.* This treatment, fortunately seldom practiced by Dr. Gray, left no specimens to represent the typical species. We are therefore obliged to consider the Brewer plant as the type of the species, reducing the varietal name to synonymy. The desert form, *Palmeri*, does not seem distinct.

Distribution: Southern Monterey County, southward to Lower California, and eastward to Arizona. Dry sandy washes in the Upper and Lower Sonoran.

Specimens examined: Fort Tejon, *Heerman; Rothrock 276;*

Sierra Santa Monica, *Brewer 71* (type); San Gabriel Canyon, *Abrams 885;* San Antonio Canyon, *Baker 3466;* Santiago Canyon, Santa Ana Mountains, *Helen D. Geis 576;* vicinity of San Bernardino, *Parish 4202, 5130;* foothills of the San Bernardino Mountains, *S. B. & W. F. Parish 583;* Riverside, *Hall 1367;* Mohave Desert, *Brandegee;* wash near Monrovia, *Dudley*, Nov. 13, 1907.

17. PEUCEPHYLLUM.

1. Peucephyllum Schottii A. Gray, Bot. Mex. Bound. 74. 1859.

Psathyrotes Schottii A. Gray, Proc. Am. Acad. **9**: 206. 1874.
Inyonia dysodioides M. E. Jones, Cont. W. Bot. no. 8: 42. 1898.

Type locality: "Diluvial banks of the Colorado, in Sonora."

Distribution: Inyo County, southward through the desert region to Lower California and Sonora. Lower Sonoran.

Specimens examined: Los Palmas, *Hall 5849*.

18. TETRADYMIA.

Heads 4-flowered; plants not spinescent.
  Leaves permanently canescent. 1. *T. canescens.*
  Leaves glabrate. 2. *T. glabrata*
Heads 5–9-flowered.
  Stems clothed with slender spines; leaves not spinescent-tipped.
    Achenes canescent but glabrate. 3. *T. stenolepis.*
    Achenes with long, soft wool. 4. *T. spinosa.*
  Stems without spines; leaves spinescent-tipped; achenes with long, soft wool. 5. *T. comosa.*

1. Tetradymia canescens DC. Prod. **5**: 440. 1837.

Type locality: "In Americae borealis ora occidentali ad Columbia River."

Distribution: Eastern Washington and Idaho, southward to the mountains of southern California. Arid Transition.

Specimens examined: Mount San Antonio, *S. B. & W. F. Parish 561;* Bear Valley, *Abrams 2913, 2135;* Mount San Antonio, *Abrams 2693;* Water Canyon, Tehachapi Mountains, *Abrams & McGregor 469*.

2. Tetradymia glabrata A. Gray, Pacif. R. Rep. **2**: 122, *pl. 5.* 1854.

Type locality: "On the Sierra Nevada."

Distribution: Mohave Desert, northward through the arid regions to eastern Oregon. Upper and Lower Sonoran.

Specimens examined: Mohave Desert, *Pringle*, May 24, 1882; Rabbit Springs, *S. B. & W. F. Parish 1259;* Lancaster, *Elmer 3676; Dudley 4313.*

3. TETRADYMIA STENOLEPIS Greene, Bull. Calif. Acad. **1**: 92. 1885.

Type locality: "Mountains of Kern Co., California." According to Hall (Univ. Calif. Pub. Bot. **3**: 227) "the type specimens were gathered a short distance southwest of the Southern Pacific railroad between Cameron and Mohave stations."

Distribution: Mohave Desert, from Antelope Valley eastward to Inyo County. Lower Sonoran.

Specimens examined: Cushenberry Springs, *Abrams 2149;* Antelope Valley, *Oliver;* hills near Kernville, *Purpus 5651;* Tehachapi, *Mrs. Curran*, 1884; Mohave Desert, *Davidson*, Aug. 1, 1901; between Tehachapi and Mohave, *Abrams & McGregor 496.*

4. TETRADYMIA SPINOSA Hook. & Arn. Bot. Beech. 360. 1840.

Type locality: "Snake Country." First collected by Tolmie.

Distribution: Eastern Oregon and Idaho, southward through the Great Basin to the Mohave Desert. Lower Sonoran.

Specimens examined: Mohave Desert, *Pringle*, May 14, 1882; Lancaster, *Elmer 3670.*

5. TETRADYMIA COMOSA A. Gray, Proc. Am. Acad. **12**: 60. 1876.

Type locality: "W. Nevada, Lemmon, S. E. borders of California, E. Palmer, Potrero, San Diego Co. D. Cleveland."

Distribution: Southern Nevada, to the southern boundary of California. In southern California this species is most frequent on the dry interior hills and plains of the coastal slope, but it also occurs, according to Parish, on the Mohave Desert in the vicinity of Lancaster and Hesperia.

Specimens examined: Potrero, *Cleveland*, 1876; *Susan G. Stokes*, July 14, 1895; vicinity of San Bernardino, *Parish*, July, 1899; Cucamonga, *Abrams 2942;* Etiwanda, *Abrams 1912;* near San Jacinto, *Hasse*, July 4, 1892; Campo, *Palmer 95.*

19. SENECIO. Groundsel.

1. Senecio Douglasii DC. Prod. **6**: 429. 1837.

Senecio regiomontanus DC. Prod. **6**: 429. 1837.
Senecio longilobus Benth. Pl. Hartw. 18. 1839.
Senecio filifolius Nutt. Trans. Am. Phil. Soc. **7**: 411. 1847.
Senecio Riddellii Torr. & Gray, Fl. N. Am. **2**: 444. 1840.
Senecio Blochmanae Greene, Erythea **1**: 7. 1893.

Type locality: "In California." First collected by Douglas.

Distribution: Lake County, southward to Lower California, and eastward to western Texas and Nebraska; common in dry sandy washes. Upper and Lower Sonoran.

Specimens examined: Tia Juana, *Abrams 3511;* Lytle Creek Canyon, *Abrams 2690;* Little Santa Anita Canyon, San Gabriel Mountains, *Abrams 2646;* near Orange, *Agnes M. Bowman*, June, 1899; San Felipe, *Susan G. Stokes*, July 24, 1895; near San Bernardino, *Parish 5103;* Acton, *Elmer 3735;* Sespe Creek, near Ten Sycamore Flat, *Abrams & McGregor 170;* Cajon Pass, *Abrams & McGregor 697.*

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BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

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TABLE OF CONTENTS

PAGE

BOTANICAL CONTRIBUTIONS:

New Species from Bolivia, Collected by R. S. Williams — I, by HENRY H. RUSBY. [*Issued separately, in advance, Nov. 23, 1910.*] . . . 487

GENERAL INDEX 518

GENERIC INDEX 524

BULLETIN

OF

The New York Botanical Garden

Vol. 6. No. 22.

New Species from Bolivia, Collected by R. S. Williams—I

By Henry H. Rusby, M.D.

Introductory Note

Some years ago the Bolivian Company, of which Sir Martin Conway was manager, sent an exploring party to eastern Bolivia to examine certain mineral and rubber-bearing lands in the province of Caupolican. In the party, which was in charge of Dr. John W. Evans, geologist, were Dr. Evans, Mr. John Turle, mining engineer, Mr. G. N. Whatney, civil engineer, all from England, and Mr. R. S. Williams, botanist, from the New York Botanical Garden. La Paz was reached Aug. 14, 1901, by railway from Mollendo to Lake Titicaca, thence by steamer across the lake to Chililaya, from which town a stage carried the party 45 miles to the city. After remaining in La Paz for some days, preparing for the trip, the Andes were crossed via the Sorata-Mapiri trail, over passes up to some 15,500 feet altitude, and down the eastern slope to Puerto Mapiri on the Mapiri river, with an altitude of some 1600 feet. Here everything was transferred from mules to rafts of corkwood, and the party floated down the Mapiri and Beni rivers to San Buena Ventura, the lowest point reached on the trip, at an altitude of some 600 feet only. Leaving the river at this place travel was resumed afoot and by mules, northwestward, mostly through forests, to the town of Tumupasa, at an altitude of about 1400 ft., where considerable collecting was done, and to Ixiamas, the most northern point of the trip. Thence the journey was southwestward to San José and Apolo, the latter town at an altitude of about 5000 ft., in which region the most extensive botanical collections were made. From Apolo one excursion was made to San Raphael on the Rio Lanza, that occupied nearly a month's time, shortly after which the whole party started back for La Paz by way of the Pelechuco Pass and Puno on Lake Titicaca. The town of Pelichuco, situated at an altitude of 11,500 ft. seemed to be in one of the finest regions for botanical collecting noted on the entire trip, but owing to lack of time and necessary outfit but comparatively few specimens were obtained. La Paz was reached the second time near the end of May, 1902, when the party broke up. Dr. Evans returned to London by way of the Amazon, Mr. Whatney crossed Peru to the coast and up to Panama by the route we had entered, while Mr. Turle and the writer returned to Apolo at the request of the company, where we remained until September. On this second trip to the interior we went from La Paz to Sorata as before, but after leaving that place kept somewhat to the left of our first route and quite near to the Sorata river, passing through the towns of Tacacoma and Consata and striking the Mapiri-Apolo trail some fifteen miles from Mapiri, at Achiquiri. Reaching Apolo the second time, June 20, we remained until about the middle of September, exploring the adjacent region, especially that about Aten to the southwest and Santa Cruz to the northward. September 13 we again started for La Paz by way of the Sorata-Mapiri trail, over roads already essentially traversed. The altitudes given are largely estimates to be considered as only approximately correct.

R. S. Williams.

List of Species

BROMELIACEAE

Pitcairnia robusta sp. nov.

Thinly floccose; stem very stout, leafy; leaves reaching 7 dm. in length, 15–18 mm. broad at the base, tapering thence regularly to a long attenuate summit, pale-green, thick, rigid, above shortly and sparsely pilose, underneath coarsely many-nerved, the margin beset with short, slender, pungent upcurved teeth about 10 mm. apart; upper leaves gradually becoming very narrow from broad clasping bases; bracts of the rachis very broadly ovate, acuminate, strongly many-nerved, the margin finely aculeate; rachis 4 dm. long, very stout, purple, bearing about 10 branches on each side, these abou 5–8 cm. long, stout and about 8–12-flowered; bracts of the flowers 12–15 mm. long, broadly ovate, acute, thick and rigid, keeled and coarsely nerved; sepals 2 cm. long, very thick and rigid, keeled and strongly nerved, acuminate; withered remains of the corolla exceeding the calyx by 6 mm.; capsule 10 mm. long, 8 mm. broad, splitting at length into 6 valves; seeds lanceolate, curved, obtuse at both ends, 5–7-nerved, winged at the ends and upon one side, and narrowly upon part of the other side.

"Apolo, 4800 ft., March, 1902" (*No. 2655*).

This species appears almost intermediate between *Pitcairnia* and *Puya*. Its capsules unquestionably split septicidally at first, but there is later a loculicidal separation, and many of its seeds are almost completely winged.

Tillandsia Williamsii (Sect. Strepsia) sp. nov.

Densely gray-lepidote; stems densely fascicled, 5–7 cm. long, spreading; sheaths 3–4 mm. long, completely clasping, strongly ribbed, abruptly contracted into the blades, which are 15–30 mm. long, 3 mm. wide, slightly wider at about the middle, lightly folded, long-acuminate; pedicels solitary, 8–12 mm. long, slender, straight, nearly glabrous, nerved; flowers not seen; bract sheathing the calyx, broadly ovate, strongly ribbed; sepals sheathing the base of the fruit, unequal, the longest 5–6 mm. long, broadly ovate, obtuse, nerved; capsule 15–18 mm. long, slightly broader above, the valves of the exocarp yellow, separating from those of the purple endocarp, and exceeding them, short-rostrate; seeds oblong, brown, very small.

"On rock, Yura, 8400 ft., Aug. 11, 1901" (*No. 2539*).

Tillandsia apoloensis sp. nov.

Gray-tomentose, the inflorescence sub-glabrous; leaves radical and basal, reduced upward to sheathing bracts, strongly reflexed, 15–25 cm. long, 8 mm. broad at the base, thence tapering gradually and regularly to a long-attenuate, lightly involute summit, the margins incurved; bracts long-sheathing, strongly ribbed, decreasing gradually upward; scape about 3 dm. long, terminating in 8 (in my specimen) sessile, loosely capitate spikes about 3 or 4 cm. long and 5–6 mm. broad, the flowers distichous, closely imbricated; bracts 6–10 mm. long, strongly 7–11 costate, mostly obtuse, thick and rigid; sepals 10–12 mm. long, very closely enrolling the flower; corolla 8 mm. long, the tube very short, the petals ovate, 6 mm. broad, finely flabellately many-nerved; scales wanting; filaments very short and slender; anthers oblong, 2 mm. long; stigmas reaching to about the middle of the anthers; ovary about as long as the anthers or a little longer, oval; style half as long as the anthers, thick, sharply angled; fruit not seen.

"Apolo, 4800 ft., Sept. 11, 1902" (*No. 1483*).

Catopsis gracilis sp. nov.

Basal sheaths white-tomentose, decreasingly pilose above; leaves densely rosulate at the base, 4–8 cm. long, 8 mm. broad a little above the middle, narrowed downward, above gradually attenuate, finely many nerved; bracts of the stem linear-attenuate;

stem about 3 dm. high, erect or ascending, slender, paniculate above, the branches very slender, ascending, rather densely flowered; floral bracts about two-thirds the length of the strongly recurved pedicel, ovate, acute; sepals 2 mm. long, ovate, acuminate, rigid; petals (yellow?) 5–6 mm. long, lanceolate, nerved; longest filament 3 mm. long, its strongly curved anther half its length; pistil equaling the filaments, the style half as long as the ovoid, winged ovary, stout, linear, entire; capsule 3 mm. long.

"Guanai, 1500 ft., Sept. 27, 1901" (*No. 738*).

COMMELINACEAE

Floscopa perforans sp. nov.

Stems rooting and rhizomatous at the base, simple, 5–10 cm. high, bearing a single panicle at the very base and one or more at the summit, stoutish, clothed below with several sheaths, or very small blades, and bearing at the summit about 4–6 perfect leaves; petioles short and broad, ciliate, the base sheathing; blades 6–9 cm. long, 25–40 mm. broad, oblong-lanceolate or oblanceolate, acuminate and very acute, thickish, minutely puberulent and slightly harsh, very finely and inconspicuously nerved; basal panicle long-peduncled, the peduncle being really a branch clothed with sheaths or very small blades, the tomentose panicle 25–30 mm. long and broad, rather dense; terminal panicle similar but about twice as large, sessile; bracts ovate, thin, about as long as the pedicels, deciduous; calyx 3–3.5 mm. long, usually exceeding the pedicel, the sepals thick, broadly oval, obtuse, almost completely enclosing, but slightly shorter than the pod; pod strongly compressed, nearly circular, narrowly winged and bearing a strong rib on each side continuous with the persistent style, which is as long as the pod, very slender, recurved; seeds 2, irregularly triangular, gray, very strongly ribbed.

"Trail between Ixiamas and Tumupasa, 1500 ft., Dec. 29, 1901" (*No. 285*).

The same collected by Spruce (*No. 3902*) and Traill (*No. 1147*).

Commelina Bangii sp. nov.

Younger portions, leaves, etc., minutely puberulent; stems 4–8 cm. long, very slender, prostrate and creeping, the terminal half erect, the internodes mostly 8–10 mm. long; basal portions clothed at the nodes with truncate, membranaceous, nerved, loose sheaths similar to those of the leaves; blades 12–25 mm. long, 5–8 mm. broad, ovate, finely nerved, the midrib prominent underneath; spathe solitary on a slender peduncle longer than itself, 12 mm. long, and nearly as broad, strongly cordate, the basal leaves nearly semicircular, acute, 11–13-ribbed; peduncle stoutish, half the length of the bract; pedicels very short, stout; larger sepal half the length of the corolla, which is deep blue and 5 mm. long. Dissection material wanting.

"Tumupasa, 1800 ft., Dec. 10, 1901" (*No. 338*). This is the same as *Bang No. 463*, which has been regarded as a small form of *C. gracilis* R. & P.; but this second collection, from a different locality, with the same characters lead me to believe it distinct. At Kew, the plant is classed as *C. nodiflora* L. forma *agrestis*, but I cannot believe it to be of that species.

LILIACEAE

Asagraea longiflora sp. nov.

Glabrous; roots coarse, flexuous; leaves radical, many of them falcately ascending, 5–15 cm. long, reaching 6 mm. broad, linear-attenuate, sharply and strongly plicate, bright-green; scapes leafless, some bearing one or more linear attenuate rigid bracts near the base, and smaller and broader ones above, erect or ascending, 30–45 cm. long, very slender, purplish above; spikes in flower about 5 cm. long, a half longer in fruit, loosely flowered, the rachis sulcate; bracts at the base of pedicel 3 mm. long, exceeding the pedicel, broadly ovate, clasping, long-acuminate and very acute; those at the base of the flower 3 or 4, similar but broader and shorter; perianth segments (yellowish?) 6 mm. long, subequal, oblanceolate, acutish, erect, rigid, about 7-nerved; stamens 5 mm. long, the oblong anthers one-fourth of the length, the filaments dilated below; ovary oblong, angled, twice the length of the styles and stigmas, the last-named reaching to about the middle of the anthers; capsule nearly equaling the purplish perianth, exceeding the persistent stamens, broadly oblong, 6-angled above, tipped by the persistent, lightly spreading styles.

"Near Apolo, 5800 ft., July 24, 1902" (*No. 1471*).

AMARYLLIDACEAE

Hippeastrum viridiflorum sp. nov.

Bulb, leaves and fruit not seen, otherwise glabrous, about 6 dm. high; scape stout; bracts of spathe 2, distinct, 5–6 cm. long, nearly 2 cm. broad, acuminate, purple at the base; pedicels 3, about 7 cm. long, erect, the flowers slightly declined; ovary obovoid, about 1 cm. long, 4 mm. broad; flowers about 20 cm. long, 10 cm. broad, green; perigone-tube at summit of ovary about two-thirds as broad as the latter, very gradually enlarging upward to the throat; perigone divided about two-fifths of the way to the base, the lobes oblanceolate, mucronate, about 3 cm. broad; filaments inserted at about the middle of the tube, moderately unequal, the longer nearly equaling the perigone, much thickened below, attenuate above; anthers 5–6 mm. long, oblong, attached at the middle of the back; style filiform, about equaling the stamens, nearly uniform throughout; stigma broader than long, of three short, rounded lobes.

"Near Machichoriza, 3500 ft., Aug. 5, 1902" (*No. 1618*).

Hippeastrum crociflorum sp. nov.

Specimens 3 dm. high, glabrous, the leaves not seen, the scape dilated upwards; bracts of the spathe 2, distinct, oblanceolate, obtuse, 4–5 cm. long, thickish, deep-purple; pedicels 2, slender, 1.5–2 cm. long; ovary 6 mm. long, 4 mm. broad, oblong; perigone-tube about 15 mm. long, infundibular, the lobes 5 cm. long, 2 cm. wide, rose-purple; filaments much thickened below, moderately unequal, shorter than the corolla; style about equaling the corolla, the stigma shortly and broadly 3-lobed, the lobes rounded.

"Guerratuma River, 3500 ft., Aug. 9, 1902" (*No. 1617*).

DIOSCORIACEAE

Dioscorea oblongifolia sp. nov.

Stems slender, irregularly angled; petioles 12–20 mm. long, slender, sharply channelled above; blades 6–9 cm. long, 3–4.5 cm. broad, nearly oval, lightly cordate with a broad sinus, very shortly abrupt-acuminate and acute, strongly 3-nerved, with often an additional, incomplete pair, light-green, the venation anastomosing; racemes loosely panicled, the rachis very slender, mostly about 15 cm. long, in fruit, densely fruited; fruit purplish, minutely puberulent, shortly stipitate, the stipe strongly reflexed; capsule strongly compressed, 12–15 mm. long, 15–20 mm. broad, emarginate, the very short stout style at length deciduous; stigma 1.5 mm. broad, 6-angled and with a ridge running from the center to each angle, upon the upper surface, and 3 slightly projecting light colored small bodies at the center; wings bearing very many exceedingly fine nerves running transversely from the axis to the thickened margin; seed nearly orbicular, about 8 mm. broad, including the light-brown wing, which is two-thirds as broad as the red seed.

"Apolo, 4800 ft., July 22, 1902" (*No. 1491*).

Dioscorea acanthogene sp. nov.

Branches slenderly costate, roughish with fine tubercles; petioles 12–18 mm. long, slender, articulated upon a stout falcate base 6 or 8 mm. long, which persists and enlarges to form a very stout curved, striate, brown-tipped spine, from the upper edge of which the branchlets of the following season proceed; blades 7–11 cm. long, 5–8 cm. broad, ovate, cordate, slightly pointed, thick and coriaceous, sharply 7–9 ribbed, the slender anastomosing venation sharply prominent on both sides; panicles (pistillate only seen) drooping, much-branched, the branches 15–30 cm. long, slender, remotely flowered, the flowers sessile; bracts small, subulate, thin, reddish; flowers puberulent externally, about 9 mm. long; ovary about 6.5 mm. long, slightly curved; winged segments about 2.5 mm. long, ovate, obtuse, bearing a dark midrib; staminodia at the bases of the segments, very small; style conical, short and stout, not quite so long as the perigone-segments nor as the stigmas, which are 2-cleft, linear, tapering, the divisions spreading horizontally and up-curved.

"Mychariapo, 3500 ft., Apr. 8, 1902" (*No. 245*).

IRIDACEAE

Sisyrinchium alatum minor var. nov.

Stems 15–25 cm. high, slender; petals 6–8 mm. long; capsule 5 mm. long.

This plant is smaller, not only as a whole, but in all its parts, than the type, from which I cannot at present otherwise distinguish it.

"Flowers yellow. Hills near Apolo, 6000 ft., Feb. 20, 1902" (*No. 114*).

Cipura major sp. nov.

Glabrous; bulb broadly ovoid, about 13 mm. long, brown; radical leaves 15–30 cm. long, the lower portion narrowed to the base, erect, the upper portion spreading, 6–8 mm. broad, attenuate, strongly plicate; scape very slender, 7–10 cm. long, the floral leaf similar to the others and exceeding them; spathes imbricated, the upper successively longer and reaching a length of 3 cm., ovate-acuminate and very acute; flowers apparently 3, bright-blue; pedicel very slender, 7 mm. long, enlarging very gradually into the ovary, which is 6 mm. long, oblanceolate and sharply ribbed; petals sessile or nearly so, 12–16 mm. long, obovate; slender filament and oblong anther each about 2.5 mm. long; style 6 mm. long, slightly enlarged upward, the stigmas short, broad, spreading; capsule 5 mm. long, oval-oblong, obtuse, brown; seeds black, irregularly angular, very small, numerous.

"Species very near *C. paludosa* Aubl.

"Tumupasa, 1800 ft., Dec. 16, 1901" (*No. 546*).

ARACEAE

Heteropsis boliviana sp. nov.

Branchlets annulate, the annulae narrow, transverse or oblique; petioles 3 mm. long, cuneate; blades oblong or lance-oblong, acuminate at both ends, the apex very acute, rigid when dry, very dark green, 7–15 cm. long, 25–40 mm. broad, the midrib stoutish, the very numerous secondaries slender, lightly ascending and communicating to form a line about 1 mm. from the margin; peduncle slender, recurved in fruit; flowering spathe 35 mm. long, including the acuminate base, oblong-lanceolate, the rigid, narrow terminal acumination about 6 mm. long, enclosing the spadix; spadix in young fruit 18–20 mm. long, 6 mm. broad, oblong, exhibiting 3 spirals and subtended by the remains of the spathe;

young fruit drying black, truncate, irregularly quadrilateral in outline, bearing the short blunt style in the center and surrounded, and a little exceeded by the thick, stout, light-brown unequal anthers.

"Climbing over trees, Isapuri, 1550 ft., Oct. 5, 1901" (*No. 721*).

Monstera boliviana sp. nov.

Petioles reaching 30 cm. or more in length, very stout, the sheath extending to the base of the blade, finely many-ribbed, minutely granular-roughened; blades reaching 45 cm. or more in length, and half as broad, ovate, moderately inaequilateral, truncate to subcordate at the base, shortly abrupt-acuminate and acute at the summit, perforated on both sides, the perforations long and narrow, some severing the margin, occasionally smaller ones interposed near the midrib; principal secondaries about 10–13 on each side, connecting to form a line almost at the margin; those of second and third grade numerous, slender, rather freely anastomosing; peduncle (but one seen) 15 cm. long, slender, nearly straight, finely nerved, the spathe deciduous; spadix in fruit 7.5 cm. long, 13 mm. thick, cylindrical; summit of fruit about .4 mm. broad, concave.

"Common on trees, Isapuri, 1500 ft., Oct. 10, 1901" (*No. 676*).

Monstera unilatera sp. nov.

Petioles 7–12 cm. long, the sheath extending to within 6 or 8 mm. of the blade, its base meeting about the stem, wholly deciduous and leaving a slender annulus, very finely many striate; blades 12–18 cm. long, 4–7 cm. broad, oblong-ovate, very inaequilateral, the margin of the narrower side nearly straight, slightly convex, very slightly and abruptly produced at the base, abruptly short-acuminate and acute at the summit, bearing from 1–3 (?) perforations on the larger side only, these broadly oblong or oval, of small or medium size; veins very numerous, very slender, strongly upcurved, obscurely connecting; peduncle solitary in my specimen, 6.5 cm. long, curved, slightly enlarged upward, striate; spathe thick, 40 mm. long, oblong-oval, finely many-nerved; fruiting spadix (mature?) cylindrical, apparently about 60 mm. long, nearly 12 mm. thick, the fruit lightly concave upon the summit.

"San Buena Ventura, 1400 ft., Nov. 25, 1901" (*No. 526*).

MUSACEAE

Heliconia Pearcei sp. nov.

Glabrous; petiole of the one leaf seen 13 cm. long, costate above the sheath; blade 8 dm. long, 15 cm. broad, oblong, oblique at the base, shortly pointed, shining, the midrib strong, nearly terete, yellow, the venation very fine and regular, nearly at right angles with the midrib; bracts about 2.5 cm. apart, 5–15 cm. long, nearly horizontal, strongly folded, the folded half 5–8 mm. broad at its insertion, quickly broadening to twice that width, then gradually tapering and finally obtusish, finely many-nerved; spathes thin, nearly as long as the bract, acuminate and acute; rachis thick and fleshy; flowers crowded at the basal portions of the bract, all fallen from my specimen, as well as nearly all the fruits; pedicels much exserted, 6–12 mm. long, stout, upwardly thickened and bearing a broad summit where the fruit has fallen away; fruit 5 mm. long, two-thirds as broad at the summit, turbinate.

Species about intermediate between *H. psittacornu* and *H. brasiliensis*.

"8 ft. high, Charopampa, 1600 ft., Sept. 28, 1901" (*No. 704*). The same collected by Pearce, probably at Santa Ana.

MARANTACEAE

Calathea Sprucei (Sect. Microcephalum) sp. nov.

Herb small, acaulescent, glabrous except for a very minute pubescence on the upper leaf surfaces; petioles 6–9 cm. long, the sheaths extending to the base of the blades, which are about 10 cm. long and 4 cm. broad, oval, slightly inaequilateral, abruptly short-acuminate, the nervation fine, rather loose; peduncle 12 cm. long, very slender, very slightly thickened near the summit; spike 18 mm. long, loosely oval, few-flowered; scales 8–10 mm. long, broadly ovate, acuminate, finely and regularly many-nerved, the inner narrower and shorter, the flowers exserted. Dissection material wanting.

"Tumupasa, 1800 ft., Dec. 11, 1901" (*No. 608*). The same as *Spruce No. 4523*.

Calathea exserta (Sect. Breviscaposa) sp. nov.

Minutely puberulent; petioles 2 or more, radical, 12–20 cm. long, erect; sheath narrow, extending to the blade, 20–30 cm. long, 12–20 cm. broad, oval, very abruptly contracted into the petiole, acute, puberulent above and on the midrib underneath, the secondaries very numerous and regular, connected by very fine, straight, regular veins; peduncle (but one seen) 9 cm. long, erect, thickened upward; spike 5 cm. long, 18 mm. broad, oblong, obtuse, dense, tomentose; bracts closely imbricated, about 2 cm. long and broader, the summit rounded, except those of the uppermost, which are acuminate; flowers exserted; exserted anther 5 mm. long, narrowly linear, rigid; dissection not made.

"Flowers white and purple; Ixiamas-Tumupasa trail, 1500 ft., Dec. 29, 1901" (*No. 296*).

Species near *C. Petersenii* and almost the same as *Eggers No. 14,067*.

Calathea pilosa sp. nov.

Stem stout, angled and, like the petioles, coarsely pilose, the hairs erect-spreading; petiole nearly a meter long, stout; blades of the longer leaves 5 dm. long, 15 cm. broad, oblong, the summit very abruptly contracted into a short, broad acumination, very finely many-nerved, the nerves strongly ascending; peduncles 3, in my specimen, stout, unequal, the longest 6 cm. long; heads 5–7 cm. long, 3–5 cm. broad, oval, the bracts densely imbricated, about 4 cm. long, and broader, ovate, obtusish, coarsely ciliate, thick and rigid; bractlets very unequal, broad, pilose at the base, the summit fimbriate, the outer mucronate; flower 10 mm. long; sepals longer than the petals, strongly pilose externally; filaments broadly petaloid, the anther broad; style thick, involute, the stigma cucullate, 2-lobed.

"6 ft. high; San Buena Ventura, 1500 ft., Nov. 27, 1901" (*No. 354*).

Calathea nigricans sp. nov.

Pubescent, excepting the inflorescence; stem erect, 5–7 cm. high, bearing two leaves in the specimen seen; petioles 10–15 cm. long, the sheath extending to within 8 or 10 mm. of the blade, very finely nerved; blades 15–30 cm. long, 6–10 cm. broad, inaequilaterally oval, abruptly short-acuminate, abruptly contracted at the base; peduncle solitary, 25–30 cm. long, almost filiform, thickened upward; head solitary, 2–3 cm. long, broader than long, the bracts 2, thick, much broader than long, obtuse, rather coarsely nerved, drying blackish; inner scales about 15 mm. long, lanceolate-ovate; flowers wanting; fruit black, 8 mm. long, 5 mm. broad, obovoid-turbinate, sharply triangular, truncate, smooth, the flower persistent, a half longer than the fruit; seed 3 mm. long, two-thirds as broad, oval, light brown, the back bearing coarse intersecting fissures, the face a broad central ridge from which about five light lines run obliquely upward to the margin.

"Flowers yellow. Between Ixiamas and Tumupasa, 1500 ft., Dec. 29, 1901 (*No. 295*).

Species near *C. Pavonii*, but well distinguished by its indumentum.

BURMANNIACEAE

Gymnosiphon orobanchoides sp. nov.

Rhizome very slender, clothed with subulate, attenuate bracts about 1 mm. long, and very fine, sparingly branched, elongated roots; stems 15–30 cm. long, erect, very slender, obscurely nerved, bearing distant, ovate, attenuate bracts about 2 mm. long; cyme dichotomous, its branches erect, 4–8 cm. long, loosely 5–15-flowered; bracts of the inflorescence similar to those of the stem, but narrow and very thin; pedicels 3 mm. long, scarcely elongating in fruit, very slender, recurved; flower about as long as the pedicel, the hemispherical tube and the contracted limb of about equal length, the limb divided about half way, its segments broadly triangular, finely attenuate; capsule 3 mm. long and about as broad.

"In woods, near Inglis-Inglis, Aug. 15, 1902" (*No. 1636*).

JUGLANDACEAE

Juglans sp. nov.?

One leaf is all that constitutes this specimen, but this is evidently a representative one. Its petiole is 20 cm. long, slender, reddish, finely sulcate and like the rachis sparsely and very finely puberulent internodes of the rachis 5 cm. long, the leaflets of the pairs almost exactly opposite; petiolules only 1–2 mm. long, rather broad; blades 12–18 cm. long, 3.5–5 cm. broad, the middle ones the largest, lanceolate, acuminate, acute at the base, very finely and sharply unequally serrate-dentate, thin, the puberulence extremely fine and sparse on both sides, the secondaries 15–17 pairs, strongly upcurved, the venation lightly prominent above, sharply so underneath, the reticulation extremely fine.

"Tree 8 inches in diameter and 30 ft. high; San Juan, 4000 ft., April 3, 1902" (*No. 225*).

Species near to *J. rivularis*, but if the leaf described is characteristic, the species is distinct.

ULMACEAE

Celtis Williamsii sp. nov.

Branchlets, petioles, upper leaf surfaces, etc., finely puberulent, the midrib pilose underneath; branchlets elongated, slender, spreading, purple; stipules lanceolate, attenuate, caducous; petioles 5–10 mm. long, stout, spreading or deflexed; blades 7–12 cm. long, 3–5 cm. wide, ovate, slightly inaequilateral, rounded or lightly cordate at the base, abruptly short-acuminate, serrate with small appressed teeth, sub-trinerved, the secondaries about 4 on each side, slender, strongly upcurved and connecting near the margin, the venation coarsely anastomosing; dark-green, thin; spines about 5 mm. long, yellow, strongly curved, very pungent, lightly laterally compressed at the base; peduncles, in flower, about .3 mm. long, erect, stout; pedicels mostly 2, scarcely as long as the peduncles, recurved; ovary strongly pilose, longer than the pedicels, lanceolate; stamens very short, the anthers about as long as the filaments; styles about half the length of the ovary, the stigmas about 3 times as long as the styles, tapering; fruit (mature?) about 8 mm. long, ovoid, acuminate.

"San Buena Ventura, 1500 ft., Nov. 30, 1901" (*No. 603*).

This species is near *C. iguaneus* and is, I think, the same as *Bang No. 1539*, which I have heretofore regarded as of that species.

MORACEAE

Pourouma scabra sp. nov.

Branchlets very stout, densely ferruginous-pilose, as are the stipules, petioles, inflorescences, flowers and lower leaf-surfaces; stipular spathe 12 cm. long, 2.5 cm. broad in the closed condition, very thick and coriaceous; petioles (only uppermost leaves seen) 10–15 cm. long, stout; leaves deeply 5–7-lobed, the lobes 7–14 cm. long, 5–10 cm. broad, the lowermost very inaequilateral, oval, abruptly very short-acuminate, the margin crispate, very thick and coriaceous, above very scabrous, underneath pilose; midrib channelled above, prominent underneath, like the 8–25 pairs of more prominent secondaries, which are connected by numerous straight and regular veins; cymes geminate, unequal, the peduncles 4 or 5 cm. long, stout; inflorescence rather loosely branched, the longer branch nearly as long as the peduncle, rather densely flowered; pedicels very short and stout; perianth ovoid, densely ferruginous, 5–6 mm. long; stigma thick, purple, discoid, hairy, 2 mm. broad. (Only the pistillate plant seen.)

"A large tree. Santa Barbara, 5000 ft., Aug. 30, 1902" (*No. 1560*).

Cecropia obovata sp. nov.

Branchlets brown, very scabrous; stipular sheath about 10 cm. long, thick, brown, minutely floccose, sharply ribbed; petioles reaching 30 cm. long, strongly ribbed, light-brown, lightly pubescent; leaf 9–11-parted, the leaflets sessile, 10–25 cm. long, 5–9 cm. broad, obovate, cuneate, very shortly and broadly pointed, above deep-green and very finely stellate-hairy, underneath densely and shortly white-floccose, thickish, the midrib and about 20 (in larger leaflets) pairs of secondaries sharply prominent underneath, connected by numerous veins, and mostly branched near the margin; peduncle solitary, about 8 cm. long; spikes shortly peduncled, 4 in my specimen, unequal, the longer nearly as long as the common peduncle, 6 mm. thick, obtuse, white, speckled with the reddish-black small stigmas.

"A tall, slender tree, inhabited by red ants, San Buena Ventura, 1400 ft., Nov. 15, 1901" (*No. 645*).

Ficus oblanceolata sp. nov.

Glabrous; branchlets gray, annulate; stipules 12 mm. long, narrowly subulate, attenuate, thick; petioles 5 mm. long, very stout; blades 30–35 cm. long, 9–12 cm. broad, oblanceolate, obtuse at the base, abruptly contracted at the summit into a slender, very acute acumination about 2.5 cm. long; venation reddish, fine, anastomosing, sharply prominent on both sides, the secondaries 25–30 on each side, connected very near the margin; inflorescence (very young) elongated-ovoid, curved.

"Juice milky but will not coagulate. New Brazil, 5500 ft., June 13, 1902" (*No. 1660*).

Urostigma coerulescens sp. nov.

Branches rust-colored, the younger portions, stipules, young petioles, etc., sparsely coarse-pilose; stipules 14 mm. long, attenuate; leaves crowded, the petioles very unequal, up to 3 cm. long, stout, channelled above, the blades 6–10 cm. long, 4–6 cm. broad, oval, the base rounded, a very short, broad, obtuse acumination at the summit, the margin revolute; very pale or glaucous, the venation sharply prominent both sides, the lower portion of midrib channelled on the upper surface, the secondaries about 12 pairs, interarched near the margin, their branches meeting midway to form an irregular intermediate secondary, the reticulation rather coarse; fruit (mature?) globose, 6 mm broad, orange-yellow, sessile, geminate, the summit bracted.

"A large tree, 20 inches in diameter; Mapiri, 1600 ft., Sept. 17, 1901" (*No. 800*).

Urostigma costata sp. nov.

Ferruginous-tomentose throughout; stipules 8 mm. long, 5 mm. broad at the base, triangular-ovate, finely acuminate; petioles 15–18 mm. long, very stout, channelled above; blades about 15 cm. long, 7–10 cm. broad, oval, slightly oblique at the base, abruptly very short-pointed, the margin sinuate, very thick and coriaceous, pale, the midrib and about 10 pairs of secondaries stout, channelled above, very prominent underneath, connected by a fine reticulation and intersecting very near the margin; fruits about 12 mm. broad, globose, densely tomentose, the apical bracts very short.

"A tree 14 inches in diameter, with thin milky juice. Apolo, 4800 ft., April 15, 1902" (*No. 167*).

Apparently the same as one collected by Fred Muller (*No. 1586*), "Vera Cruz to Orizaba."

Urostigma Williamsii sp. nov.

Glabrous, except for the very minutely muricate and puberulent leaf-surfaces; petioles 2–3 cm. long, stout; blades 7–14 cm. long, 4–8 cm. broad, oblong, rounded at the base, a short, broad mucronation at the summit, entire, thick, drying brown, the venation slender, slightly prominent above, sharply so underneath, finely reticulate, the secondaries about 10–12 on a side, coarsely anastomosing near the margin; fruits in pairs, sessile, globose, 12 mm. broad, the bracts at the summit bearing two hemispherical reddish bodies about 2 mm. broad.

"Ixiamas-Tumupasa trail, 1500 ft., Dec. 29, 1901" (*No. 413*).

Species very near *U. glabra* Meyer, and *Gardner No. 5631*.

Williams No. 146, "a tree 14 inches in diameter and 35 ft. high, with thin milky juice, Apolo, 4800 ft., April 16, 1902," is probably the same, though its leaves are twice as large and its fruit a half larger. The latter wants the peculiar bracts upon the summit, though these may have fallen off.

No. 420, "a slender bush, the fruit striped and spotted with purple, Tumupasa, 2500 ft., Jan. 4, 1902," may be the same, but is probably distinct. Its leaves are relatively narrower, and are thin and inclined to be slightly broadened upward. It bears stipules 14 mm. long, tapering finely from the base. Its fruit is similar to that of *No. 413*. It is the same as *Tonduz No. 11,576* and very near *Spruce No. 2217*, which is called *U. leucosticta* Miq.

URTICACEAE

Myriocarpa filiformis sp. nov.

Branches red, glabrous; branchlets like the petioles and leaves, minutely strigose; stipules reddish, 12 mm. long, ovate, acuminate; petioles slender, 15–30 mm. long; blades 7.5–15 cm. long, 4–8 cm. broad, ovate, subcordate, slenderly acuminate and acute, dentate, with the short teeth and sinuses obtuse, thin, deep-green, the purple venation prominent both sides, the secondaries about 8 on each side, interarched near the margin; peduncles slender, 2 or 3 cm. long, issuing from short, ovate, stipule-like bracts, and bearing from one to three very slender, densely flowered ferruginous spikes, 15–30 cm. long; bractlets very small; pistils stipitate, the stipes a half to nearly as long as the ovary; flowers, exclusive of stipe, about 2 mm. long; ovary broadly ovoid, green; style nearly as long as ovary, tapering; stigmas large, as long as style.

"A tree 20 ft. high and 8 inches in diameter; Mapiri, 1600 ft., Sept. 19, 1901" (*No. 768*).

LORANTHACEAE

Phthirusa heterophylla sp. nov.

Glabrous, except for a ferruginous scaly scurf on the younger parts; branches elongated, slender; leaves opposite, the petioles 10–12 mm. long, stout, divaricate; blades ovate, subtruncate at the base, the summit rounded, sinuately contracted above the middle, thickish, the venation slender, coarsely and very irregularly reticulate, slightly prominent on both sides; spikes 2–5 cm. long, short-peduncled, slender, simple or occasionally branched near the base, loosely flowered, the flowers in threes; bracts triangular-ovate, acuminate, the summit whitish; flowers not open in my specimen, apparently very small; fruits oblong-ovoid, purple or glaucous, 5 mm. long.

"A slender shrub, San Buena Ventura, 1400 ft., Nov. 13, 1901" (*No. 667*).

Phthirusa robusta sp. nov.

Glabrous; branches very stout, the branchlets coarsely and sharply angled; petioles 2.5–3 cm. long, stout, channelled above; blades extremely unequal and irregular in form, 10–15 cm. long, 4–8 cm. broad, lanceolate to ovate, the base mostly rounded, the summit either acuminate or terminating bluntly and irregularly, very thick, the lower portion of the midrib channelled on the upper surface, the venation obscure; panicles mostly solitary in the axils, the peduncles about as long as the petioles, the flowering panicles about 5 cm. long and broad, trichotomous, loosely branched; bracts of the flowers triangulate, broader than long, acute, very thick; calyx-tube short, truncate, thick, the summit nearly 2 mm. broad; bud oblong, rounded at the summit; flower not seen; panicles much enlarged in fruit; berries 10 mm. long, elliptical.

"Santa Cruz, 5000 ft., Aug. 24, 1902" (*No. 1503*).

Phoradendron paucifolium sp. nov.

Glabrous; stem very short, loosely and widely branched, the branches slender; petioles very short, broad, margined; blades 8–12 mm. long, 5–8 mm. broad, ovate, mucronate, thick, the upper reduced to small narrow vestiges; spikes 2–5 cm. long, very slender, densely flowered; bracts thick, connate, the connate portion longer than the free portion, the latter broadly triangular, very acute; flowers solitary, deeply immersed, 2 mm. long, the segments very short; berries 3 mm. long, whitish, the large blue stigma half as broad as the fruit.

"Cargadira, 8000 ft., July 29, 1902" (*No. 1530*).

ARISTOLOCHIACEAE

Aristolochia Williamsii sp. nov.

Plant minutely puberulent; rhizome stout; stems 5–7 dm. long, slender, twining, angled; petioles 10–12 mm. long, slender; blades 4–8 cm. long, 2–3 cm. broad, triangular-ovate, acuminate, obtuse, the outline irregular, cordate, the sinus rounded, the basal lobes 10 mm. long, lightly incurved, blunt, the body 3-nerved, the lobes 2-nerved, the nerves slender, whitish, the reticulation coarse; flower about 5 cm. long, lightly sigmoid-curved, the basal portion about 10 mm. broad, as pressed, the middle portion 4 mm., the summit of the tube slightly broader than the base; hood strongly arched, coarsely pilose; peduncle two-thirds the length of the broadly ovoid capsule, which is 2.5 cm. long, exclusive of the stout beak, which is 6 mm. long.

"Apolo, 4800 ft., March 10, 1902" (*No. 70*).

Aristolochia apoloensis sp. nov.

Stems slender, elongated, twining; petioles 10–15 mm. long, slender; blades 4–8 cm. long, 2–3 cm. broad, triangular-ovate, acute, cordate, the sinus broad and rounded, the lobes straight, rounded, 3-nerved, the lobes 1-nerved, the purple venation finely and strongly reticulate, impressed above, prominent underneath; flowers not seen; peduncle of the capsule 15 mm. long, the capsule broadly ovoid, 4 cm. long, the stout beak 6 mm. long, then lobed at the summit; seeds 5 mm. long and broad, triangular-obtuse, slightly cordate.

"Apolo, 4800 ft., Sept. 6, 1902" (*No. 1567*).

AMARANTACEAE

Pfaffia soratensis sp. nov.

Densely strigose, the older portions glabrate; stems greatly elongated, flexuous, apparently decumbent or reclining, except the ascending terminal portion, loosely branching, the internodes very long (12–15 cm.), finely nerved; leaves opposite, all wanting in my specimen, except the floral ones, which closely subtend the inflorescence and are 6–12 mm. long, 3–6 mm. broad, oval, sessile, acutish, green above, yellowish-strigose underneath; heads sessile, subhemispherical, 10–12 mm. broad; scales shorter than the flowers and similar to the sepals; flowers 5 mm. long, densely pilose; sepals lance-ovate, long-acuminate, lightly concave, keeled; stamens equaling the sepals, the anthers 1 mm. long, oblong, bright yellow; ovary subglobose, slightly broader than long; styles and stigmas 3, two-thirds the length of the ovary, erect, thick, reddish, upwardly thickened, rounded at the end.

"Flowers yellow; Sorata, 7500 ft., Sept. 2, 1901" (*No. 2385*).

Gomphrena ixiamensis sp. nov.

Densely pilose, with long appressed hairs; stems 20–30 cm. high, ascending, loosely branched, the branches elongated; leaves opposite, 12–18 mm. long, 5–7 mm. broad, oblong-oblanceolate, acute, abruptly contracted into a very short, broad petiole, thickish, the midrib broad, reddish, the venation obscure; heads solitary at the ends of the branchlets, bearing two small leaves at the base, broadly ovoid, rounded at the summit, 8–16 mm. long, gradually elongating as the flowers fall at the base; scales 2 mm. long, broadly triangulate, scarious, with a broad greenish keel which is continued into an awn; bractlets 8 mm. long, slenderly acuminate; perianth very woolly, the segments subequal, 6 mm. long, narrowly lanceolate, rigid, attenuate, one-third longer than the style; stigmas 3, large, oblong, black, exceeding the stamens.

"Ixiamas, 1500 ft., Dec. 24, 1901" (*No. 273*). The same as *Rusby No. 1515* and *1516*.

Mogiphanes soratensis sp. nov.

Pilose throughout; stems elongated, slender, prostrate, rooting at the joints, mostly deeply channelled on one side above each node, the hairs rather few, spreading; leaves mostly reddish, 4–6 cm. long, 1.5–4 cm. broad, ovate, abruptly contracted into a short petiole, acute, thin, sparsely pilose above, freely so underneath; the secondaries about 4 on each side, strongly ascending, the venation not prominent; peduncles 5–7 cm. long, very slender; heads broadly ovoid and obtuse or subglobose, nearly 2 cm. long; perianth 3 mm. long, the bracts lance-ovate, obtuse, more then twice as long as their broadly ovate, acuminate, acute bracts and very slightly longer than the stamens; anthers broadly oblong; akenes not seen.

"Sorata, 7500 ft., Sept. 2, 1901" (*No. 2384*). The same as *Rusby No. 1520.*

Mogiphanes paniculata sp. nov.

Stems 5–7 dm. long, rooting at the base, erect or ascending, loosely branched, channelled, the internodes about 7 cm. long; leaves 2–4 cm. long, 1–2 cm. broad, ovate, abruptly contracted into a very short petiole, thickish; inflorescence loosely paniculate; heads varying from sessile to rather long-penducled, broadly ovoid, obtuse, 10–12 mm. long; bracts 2.5–3 mm. long, scarious, broadly ovate, carinate, the keel prolonged into an awn half as long as the body; perianth 3.5–4 mm. long, the segments ovate-lanceolate, obtuse; stamens two-thirds the length of the perianth.

"Sorata, 7500 ft., Sept. 1, 1901" (*No. 2401*). Species very near the last but well distinguished by its indumentum, smaller leaves, paniculate inflorescence with stouter and shorter penducles, and shorter stamens with smaller anthers.

CARYOPHYLLACEAE

Tissa pazensis sp. nov.

Scabrous; stems much branched from the base, the branches erect or ascending, 15–30 cm. long, articulated, very slender; stipules imbricated at the base, about 4 mm. long, broadly ovate, acuminate, white, very thin and scarious; leaves opposite or mostly fascicled, very unequal, the largest 12 mm. long, linear, acute; branches of the cyme 2, elongated, loosely flowered; pedicels slender, erect, longer than the flower, unequal, some 18 mm. long, in fruit; sepals, in flower, 6 mm. long, 2–2.5 mm. broad, oblong, obtuse, the middle third thick, green and scabrous, the margins thin and scarious; petals two-thirds as long as the sepals, broadly oval, obtuse, very thin, finely nerved, white or faintly pink; stamens nearly as long as the petals, the filaments stout, narrowed upward, the anthers oblong; ovary ovoid, smooth, half as long as the petals;

style half as long as the ovary, 3-cleft; capsule 6 mm. long, purplish; seeds flat, nearly orbicular, brown, with a broad white complete wing.

"La Paz, 11,500 ft., Aug. 20, 1901" (*No. 2336*).

No. 1541, from Sorata, 7000 ft., Oct. 2, 1902, is probably a form of the same. It is a smaller and more simple plant, its leaves a half longer, and more narrow, its cymes small and few-flowered, the fruits larger. Flowers are wanting. The fruiting sepals are larger and brown. The seeds are slightly larger and with a broader wing. The specimens are the same as *Mandon No. 946*, in Herb. Kew as *Spergularia arenarium* Lindl, but are apparently distinct from that species. It also bears the name *S. media glandulosa.*

ANONACEAE

Guatteria (?) ponderosa sp. nov.

Glabrous; branchlets stout, purple; petioles 8–10 mm. long, very thick; blades 12–20 cm. long, 5–7 cm. broad, lance-ovate, very inaequilateral, falcate, thick, slightly shining above; venation lightly prominent both sides, coarsely reticulate; flowers borne on elongated leafless branchlets; pedicels about 15 mm. long, slender; calyx lobes purple, subrotund, 3 mm. broad; petals tomentose, subequal, 8 mm. long, broadly ovate; stamens very numerous, densely massed, slightly exceeding the styles, the mass 8 mm. broad; style-mass light yellow, about 4 mm. broad, the stigmas about 15, large, strongly truncate; seeds brown, oval with rounded ends, compressed, 3 cm. long, 2 cm. broad, the margin ridged two-thirds of the way around, the ridge with fissured hilum at the broader end.

"A tree 2 feet in diameter and 45 feet high, the separate carpels forming large smooth edible fruits weighing about a half pound; Apolo, 4800 ft., Sept. 11, 1902" (*No. 1479*).

Guatteria tomentosa sp. nov.

Ferruginous-tomentose, the branches hirsute with reflexed hairs, elongated, purple, leafy, the internodes 15–20 mm. long; petioles 2–4 mm. long, very stout; blades 10–15 cm. long, 18–35 mm. wide, oblong, abruptly short-acuminate, rounded at the base, entire, thick, very sparsely pilose above, more so below with the midrib hirsute, the secondaries about 15 pairs, the venation lightly prominent on both sides; flowers solitary or occasionally 2 in the axils, the peduncles 10–12 mm. long, stout, erect; outer sepals 8 mm. long, 6 mm. broad, ovate, obtuse, ferruginous outside, deep-purple and nearly glabrous inside; inner petals similar but narrower, 2 cm. long, ferruginous except at the base, within, the outer ones half as large; stamen-mass 6–7 mm. broad, the stamens

1.5 mm. long, brown, equaling the yellow pistils, which are at first tufted at the summit.

"A small tree, 20 ft. high; Tumupasa, 1800 ft., Dec. 11, 1901" (*No. 753*).

The same as *Bang No. 1176.*

Symbopetalum (?) **parvifolium** sp. nov.

Glabrous; bark gray, roughly fissured; branchlets short, slender, flexuous, leafy; petioles 4–8 mm. long; blades 3–10 cm. long, 12–30 mm. broad, lanceolate, acuminate and obtuse, coriaceous, shining, the secondaries numerous, straight and slender, the principal ones interarching close to the margin, the venation prominent on both sides; peduncle recurved, thickened upward; carpels about 12, on thick stipes 6 mm. long, 2–2.5 cm. long, 8 mm. broad, oblong, obtuse, falcate, grooved on the midrib, about 6-seeded; seeds yellowish or brown, oval, slightly compressed, 6 mm. long, transversely rugose, the marginal grooves narrow.

I am in some doubt as to whether this is not a species of *Asimina*, which its foliage more resembles. In the absence of flowers, I cannot determine this point.

"A small tree; Tumupasa, 1800 ft., Jan. 6, 1902" (*No. 511*).

Symbopetalum monospermum sp. nov.

Glabrous; branchlets very slender, the internodes 18–25 mm. long; petioles 4 mm. long, very thick; blades 15–20 cm. long, 5–7 cm. broad, obovate, abruptly contracted into a short obtuse point, entire, thin; secondaries about 8 on each side, interarching, like the coarsely reticulate, slender venation, lightly prominent on both sides; peduncles axillary, solitary, 4–5 cm. long in flower, longer in fruit, erect, very slender, thickened upward; sepals very short and broad; outer petals 8 mm. long, 5 mm. broad, ovate, obtuse or minutely mucronate, thick, the inner of about the same length but narrower, concave below, above very thick, the apex inflexed; stamen-mass 5 mm. broad, 4 mm. long; stamens yellow; stigmas capitate, depressed; carpels few, the stipes at maturity 10–12 mm. long, the ripe carpels inaequilaterally oval, 9 mm. long, one-seeded; seed reddish-brown, shining, coarsely dark-pitted, the two grooves large.

"A tree 30 ft. high and 8 inches in diameter, with yellowish flowers and thick petals; San Buena Ventura, 1400 ft., Nov. 12, 1901" (*No. 670*).

LAURACEAE

Persea (?) **filipes** sp. nov.

Wholly glabrous, the branchlets slender, deep-purple, very leafy; petioles slender, about 1 cm. long, slightly margined at the summit by the very abruptly contracted base of the blade; blades

5–8 cm. long, 2.5–4 cm. broad, ovate, the subrotund base very abruptly contracted into the petiole, the summit abruptly short-acuminate and obtuse, very thick, the slender, reticulate venation slightly prominent on both sides, the secondaries irregular, 6–10 on each side; racemes or loosely few-flowered panicles axillary and terminal, the peduncles and branches slender; thickened portion of pedicels about 5 mm. long, continuous with the calyx; calyx 6–8 mm. broad, and about as long, the segments nearly equal, broadly triangular-ovate, obtuse, thick and fleshy, shining, not closely appressed; berry 7–10 mm. long and two-thirds as broad, regularly elliptical-ovoid.

"A bush, 12 ft. high, Tumupasa, 1800 ft., Dec. 7, 1901" (*No. 352*).

Persea (?) sp. nov.

Branchlets short, stout, widely spreading, gray, moderately leafy; petioles 5 or 6 mm. long, stout; blades 5–10 cm. long, 2–5 cm. broad, oval, the base subrotund, very slightly produced, abruptly very short-pointed and acutish at the summit, sparsely ferruginous puberulent underneath, thick, the venation finely reticulate, strongly impressed above, sharply prominent underneath, the secondaries 5–7 on each side, strongly upcurved; racemes axillary, mostly shorter than their leaves, loosely few-flowered, the peduncles, rachis and pedicels stoutish; pedicels very short, nearly as broad as long; calyx about 5 or 6 mm. broad, widely spreading, the lobes subequal and broadly triangular-ovate, obtuse, slightly thickened; berry deep-purple, 6 to 8 mm. long, half as broad, oval.

"A bush, Apolo, Mar. 2, 1902" (*No. 14*).

Ocotea Trianae sp. nov.

Bark of the trunk smoothish, light-gray; younger portions and lower leaf-surfaces finely and very closely sericeous; leaves 7–15 cm. long, 3–5 cm. broad, oblong and mostly somewhat inaequilateral, acuminate at both ends, the base contracted into a short, broad, channelled petiole; upper surface smooth and shining, the midrib and 12–15 pairs of strongly upcurved secondaries impressed, the very finely reticulate venation elevated, beneath sericeous, all the venation very prominent, the secondaries connected by straightish tertiaries; panicles solitary in the upper axils, slightly exceeding their leaves, the short peduncle one-third to nearly one-half the total length, broad and loose in fruit (flowers not seen); fruits sessile or on very slight, thick pedicels; calyx 5–7 mm. long, 6–7 mm. broad at the mouth, which is slightly contracted from near the base, truncate and the margin beset with minute, white-pilose tufts; fruit exserted for about one-third of its length, elliptical, very finely many-nerved.

"Thirty ft. high and 6 inches in diameter; Rio Chiarra, 4000 ft., Sept. 16, 1902" (*No. 1475*).

Exactly the same as *Triana No. 2052*, also in fruit.

Ocotea (?) **illustris** sp. nov.

Bark of trunk light-gray, roughened with transversely elongated small lenticels; glabrous; branchlets sharply many-nerved very leafy; petioles 15–20 mm. long, stout, broadly channelled, blackish; blades 10–20 cm. long, 4–8 cm. broad, oblong or slightly lance-ovate, abruptly short-acuminate, the base very abruptly contracted into the petiole, very thick, above shining, the midrib and 6–8 pairs of very strongly ascending secondaries impressed, the latter connected by numerous straightish tertiaries, beneath pale, the extremely finely reticulate venation almost completely covering the surface; panicles long-peduncled, much shorter than their leaves, small, few and loosely flowered; flowers not seen; fruiting calyx-tube 5–6 mm. long, about 9 mm. broad, hemispheric-crateriform, abruptly contracted into a short stipe-like base, very rugose, truncate; fruit about 12 mm. long, 7 mm. broad, elliptical, finely rugose.

"A tree 14 inches in diameter; San Buena Ventura, 1400 ft., Nov. 18, 1901" (*No. 642*).

Ocotea oblanceolata sp. nov.

Glabrous; branchlets slender, ascending; petioles 8–10 mm. long, broad, channelled, the margins incurved; blades 8–16 cm. long, 3–6 cm. wide, oblanceolate or obovate, abruptly, very shortly and obtusely acuminate, gradually narrowed from near the summit, then abruptly contracted into the petiole, rather thin, very pale and smooth; venation slender, lightly prominent beneath, the secondaries about 10 pairs, lightly interarching near the margin; panicles sessile at the ends of short, leafy branchlets, extremely small and few-flowered; flowers not seen; fruiting calyx 6 mm. long, 12–14 mm. broad, crateriform, truncate, thin, rough; fruit 2.5 cm. or more long, broadly elliptical-oval, the flesh thin, heavily wrinkled in drying.

"A small tree; Mapiri, 1800 ft., Sept. 17, 1901" (*No. 822*).

"OCOTEA MARANHANA"

A specimen in Herb. Kew., collected by Pearce at Santa Cruz, bears the above name, without author, but I can find no publication of it. *Williams No. 177*, a "tree 25 ft. high and 3 in. in diameter; Apolo, 4800 ft., Apr. 17, 1902," seems to be the same.

Williams No. 1488, a "tree 20 ft. high and 5 in. in diameter; Apolo, 4800 ft., Aug. 17, 1902," in fruit, may be the same, though the racemes appear much shorter.

Nectandra Guanaiensis sp. nov.

Inflorescence finely tomentellate, otherwise glabrous; branchlets stout, ascending; petiole (but one seen) 2 cm. long, stout; blade more than 3 dm. long, and 10 cm. wide, oblong, abruptly short-acuminate at both ends, thick, pale, slightly shining above, with the 8 pairs of strongly ascending secondaries impressed and connected by the straightish tertiaries; panicles very large, compound, loose, the branches flattened and angular; bracts subulate, concave, mostly longer than the buds which they partly enclose, reddish; flowers shortly and stoutly pedicelled, about 12 mm. broad, the thick perianth-lobes obovate; 2 outer series of stamens 1.5 mm. long, triangular-ovate, very thick, the locelli small, at the base; inner series narrower, slightly shorter, erect, darker; ovary 1.5 mm. broad, truncate, in a cup-shaped cavity, tipped by the very small styles; glands oblong.

"A tree 8 inches in diameter and 35 feet high; Rio Guanai, 3500 ft., Aug. 11, 1902" (*No. 1598*).

Species near *N. rugosa* Nees.

CUNONIACEAE

Weinmannia bullata sp. nov.

Coarsely ferruginous-tomentose or pilose, except the upper leaf-surfaces; much branched, the branchlets short, slender, suberect, blackish, very densely leafy; leaves 2–4 cm. long on very short petioles, the internodes 3–4 mm. long, 2–3 mm. wide, obovate; leaflets 9–13, 5–8 mm. long, 3–5 mm. broad, the lateral elliptical, thick, the mid-rib and 4–6 pairs of nearly divaricate secondaries very strongly impressed on the green, shining upper surface, very prominent on the brown pilose lower surface, the crenulate margin strongly revolute; terminal leaflet similar, or slightly narrowed below; spikes 2–2.5 cm. long; capsules short-pedicelled, broadly ovoid, about 2–2.5 mm. long. (Flowers not seen.)

"A bush, 10 ft. high; Cargadira, 8000 ft., July 29, 1902" (*No. 1572*).

Weinmannia obtusifolia sp. nov.

Young portions puberulent with diverging hairs; branches thickish but weak, flexuous, ascending; petioles 12–25 mm. long, the upper half narrowly winged, the greatest breadth 3 mm.; internodes of the rachis 14–16 mm. long, oblanceolate, their greatest breadth 5–6 mm.; leaflets 3–5, the lateral sessile, 3–4 cm. long, 10–20 mm. broad, oblong-ovate, obtuse, the base broadly cuneate, bluntly serrate, thickish, pale and slightly shining, the slender venation coarsely reticulate, lightly prominent beneath, the secondaries about 10–14 pairs, diverging at an angle of about 45 degrees; terminal leaflet somewhat larger, more narrowly cuneate; spikes short-peduncled, 7–10 cm. long, 8–10 mm. broad, interrupted, the verticels densely flowered; pedicels 1–1.5 mm. long, slender; sepals more than half the length of the pedicels, broadly ovate; stamens three times the length of the sepals, exceeding the styles.

"Twenty ft. high and six inches in diameter; Apolo, 5000 ft., July 13, 1902" (*No. 1438*).

The same collected by Matthews.

Species near *W. diversifolia.*

Weinmannia sessilifolia sp. nov.

Glabrate; branches short, suberect, very leafy, the internodes 3–5 cm. long, purple; leaves simple, nearly sessile, the basal portion of the midrib slightly pilose on the lower surface, 3–5 cm. long, 15–30 mm. broad, ovate, acute or obtusish, broadly rounded to truncate at the base, sharply serrate with very small, salient purple teeth, thick, pale, the finely reticulate venation prominent on both sides, the secondaries 10–12 pairs, diverging at a very wide angle, forking prominently toward the margin; spikes, in flower, about 5 cm. long, 12 mm. wide, on peduncles a little more than half as long, in fruit slightly longer and 18 mm. wide, dense, blunt; bractlets scarcely 1 mm. long, triangular-ovate, thick; pedicels 3 mm. long, slender; sepals similar to the bractlets, but somewhat larger; petals nearly twice as long as the sepals; stamens a half longer than the petals, the filaments thick, the anthers short and broad; styles thick, tortuous, longer than the stamens when straightened; capsules 3.5 mm. long and about equaling their styles, broadly oblong-elliptical, strongly nerved.

"Two to six ft. high; Cargadira, 8000 ft., July 29, 1902" (*No. 1522*).

ROSACEAE

Rosa repellens sp. nov.

Stems stout, branching, very spiny, the spines on the older portions very large and stout, straight, strongly laterally compressed, the others smaller and lightly recurved, all leaving elliptical-oblong scars, the younger portions glandular with short, stout, red hairs bearing capitate glands, apparently developing later into spines; stipules 12–18 mm. long, slightly amplexicaul, the free portions 3–4 cm. long, ovate, obtusish; petioles about twice the length of the stipules, stout; leaves, inclusive of petiole, 6–12 cm. long; leaflets 5–7, all much alike, the lowest smaller and the terminal slightly narrower, nearly sessile, 2–5 cm. long, 12–30 mm. broad, subrotund or broadly elliptical, roughly and irregularly serrate-dentate with short teeth, very thick, very rugose, the venation very deeply impressed above and prominent beneath, where it is more or less pubescent, strongly reticulate; petals not seen; pedicels 15–20 mm. long, very stout, angled, gradually dilating into the fruit base; calyx-lobes 18 mm. long, 5–6 mm.

broad, tapering from the base, slightly broadened near the summit, pubescent on both surfaces and glandular externally like the tube, bearing several lateral teeth or lobes which are oblong, narrowed at the base, and may themselves be several-toothed; stamens numerous, short, the anthers 1.5 mm. long; styles shorter than the stamens, very plumose; fruit infundibular with contracted throat, the perfect ones 2.5 cm. long, 6–8 mm. broad at the broadest part, deep-purple, the persistent calyx-base 8 mm. broad.

"Six feet high; by roadside, Gura, 8400 ft., Aug. 10, 1901" (*No. 2559*).

PAPILIONACEAE

Lupinus soratensis sp. nov.

Densely and finely sericeous; stems erect; stipules 10–14 mm. long, the adnate portion 4 mm. long, 3 mm. wide at the base, the free portion lanceolate, attenuate; petioles 6–10 cm. long, slender; leaflets 7–9, 4–8 cm. long, 12–18 mm. wide, oblanceolate, short-acuminate and very acute, the base long-acuminate; peduncle long and stout, the floriferous portion of raceme 12–30 cm. long, in flower about 4 cm. broad; bracts 6 mm. long, oval, complanate; pedicels 6–8 mm. long, stout; calyx strongly bilabiate, the tube short-campanulate, 3–4 mm. broad, the upper lip 6 mm. long, the lower slightly longer, boat-shaped, acuminate; lateral lobes 2 mm. long; vexillum 12 mm. long and broad, subrotund, deep-blue, the middle portion darker, the wings slightly longer, very broad, acute; style slightly exserted; pod 3–4 cm. long, 7–9 mm. broad, oblong, straight or a little recurved, the margin slightly thickened, 2–6-, mostly 4-seeded, strongly constricted between the seeds, which are about 5 mm. long, broadly elliptical, mucronulate.

"Ten ft. high, the stem 2 inches in diameter; on a gravel-bar, Sorata, 7500 ft., Sept. 4, 1901" (*No. 2430*).

Lupinus sufferrugineus sp. nov.

Densely sericeous, the stems, petioles, young leaves and fruit yellowish, the mature leaves gray; stems erect, stout, densely leafy; stipules 5–8 mm. long, linear-attenuate, the adnate and free portions in variable ratio, but mostly about equaling one another; petioles 4–8 cm. long, slender, mostly erect-spreading; leaflets 7–9, 15–25 mm. long, 6–8 mm. wide, oblanceolate, acute, thick, sericeous on both sides; racemes very short-peduncled, 7–12 cm. long, 2.5–3 cm. broad, densely flowered, the flowers light-blue; bracts similar to the stipules; pedicels extremely short and thick; calyx strongly bilabiate, the upper lip 6 mm. long, the lower slightly shorter; all petals very short-clawed; vexillum 8 mm. long and broad, nearly rotund, the middle portion yellow, much thickened; wings about as long as the vexillum, 6 mm. broad, rounded at the summit; keel equaling the wings, 3 mm. broad, strongly curved, acuminate, purple-tipped; style flexed at a right angle, stout, tapering, the horizontal portion 5 mm. long; longest stamens nearly equaling the style; anthers lanceolate, 1 mm. long; ovary about as long as the stamen-tube; pod, apparently two-thirds grown, 15 mm. long, 6 mm. wide, 3-seeded, oblong, the persistent style 8 mm. long.

"Juliaca, Peru, 12,500 ft., May 14, 1902" (*No. 2518*).

Psoralea yurensis sp. nov.

Finely gray-puberulent, the inflorescence white-pilose; stems purplish, erect; stipules 2 mm. long, ovate, acute; petioles about 2.5 cm. long, slender, mostly reflexed; leaflets 3–5 cm. long, oblong-lanceolate, acuminate and acute, acute at the base, entire, the margin thinly revolute, thin, pale, very lightly puberulent, thickly black-spotted, the secondaries 12–14 pairs, slender; racemes axillary, solitary, 10–15 cm. long including the peduncle, which is from a third to nearly half the total length, densely flowered; pedicels very short; calyx-tube elongated-campanulate, 5 mm. long, 3 mm. broad, finely many-nerved; longest lobe 4 mm., the others 3 mm. long, triangular-ovate, acuminate or attenuate; corolla exceeding the calyx by about 3 mm., yellowish-white and blue; fruiting calyx 9–10 mm. long, costate; pod 7 mm. long, ovoid, lightly compressed, acuminate and acute, minutely strigose.

"Slender, 10 ft. high; Yura, Peru, 8400 ft., Aug. 10, 1901" (*No. 2557*).

Species near *P. Mutisii.*

Parosela rubricaulis sp. nov.

More or less gray-puberulent or white-pilose, and black-glandular; branches elongated, slender, reddish, very sparsely pilose; stipules about 4 mm. long, subulate-attenuate, a little less than half adnate; petioles 3–6 mm. long, reddish, like the rachis; leaves 15–25 mm. long, 8–12 mm. wide; leaflets on short, very slender petiolules, 4–6 mm. long, 2–4 mm. wide, obovate with minutely retuse or rounded summit, above nearly glabrous, beneath gray with black glands; spikes peduncled, 15–20 cm. long, 10–12 mm. wide, curved, densely flowered, the rachis coarsely angled; bracts 4–5 mm. long, obovate, cymbiform, the beak half as long as the body, more or less purple; calyx-tube hemispherical-campanulate, 3 mm. long, 4 mm. wide, strongly 10-ribbed, the ribs purple, each interspace bearing about 4 larger purple glands; calyx-teeth broadly triangular, purple-margined and purple-aristate, the margin white-pilose within; corolla rose-purple, 8–10 mm. longer than the calyx.

"Three ft. high; Arequipa, 7500 ft., Aug. 8, 1901" (*No. 2523*).

Aeschynomene apoloana sp. nov.

Pubescent, the stems ferruginous, the foliage gray; stems numerous from a thick, woody, branching root, very slender, reaching

3–4 dm. in length, the internodes 8–12 mm. long; stipules 6 mm. long, erect, lanceolate, attenuate, sharply 7–9-ribbed; petioles 1.5–2 mm. long, the rachis 4–6 mm. long; leaflets mostly 5–7, 5–8 mm. long, 2.5 mm. broad, obovate, mucronulate, subcordate, beautifully reticulate, the secondaries 5–7 pairs, thin, gray-pilose on both surfaces; peduncles mostly exceeding their leaves, very slender; the very small bracts ovate, acuminate; pedicels slender, in fruit about 6 mm. long; calyx in flower 3 mm. long, finely nerved, the tube campanulate, about as long as the ovate lobes; corolla yellow, 7 mm. long; stipe 10 mm. long, pilose; loment 2 cm. long, straight or curved, of about 6 joints, the upper margin almost entire; joints nearly semicircular, moderately oblique, the margin conspicuously thickened.

"On grassy prairies; Apolo, Mar. 4, 1902" (*No. 25*).

Patigonium seabridum sp. nov.

Everywhere thickly beset with greenish, mostly concave glands; branches erect, slender, greenish; stipules similar to the leaflets; leaves very short-petioled, 2–4 cm. long, 5–7 mm. broad, the 9–14 pairs of sessile leaflets contiguous or even overlapping; leaflets about 3 mm. long and broader, emarginate, mostly somewhat complanate, coarsely crenate, thick, rugose; racemes reaching 3 dm. in length, erect, densely flowered, the flowers solitary in the axils of reduced leaves; pedicels 2 or 3 mm. long, in flower, twice as long in fruit, stout; calyx 4–5 mm. long and broad, campanulate, somewhat angled, the lobes broadly triangular, acute; vexillum 12 mm. long and broader, short-clawed, deep-purple with yellowish markings, or yellowish with abundant deep purple veins, glandular-hairy; wings a little shorter, more slenderly clawed, more yellow; ovary and style purple, pilose; hairs of the pod dense, blackish-purple, the copious plume grayish blue.

"Five ft. high; Yura, Peru, 8400 ft., Aug. 10, 1901" (*No. 2553*).

Also collected by Warsowiez.

Patigonium alcicornutum sp. nov.

Younger portions of stem, spines, etc., ferruginous, minutely puberulent, the leaves and inflorescence white-woolly; stems prostrate, very stout and woody, ramose, the branchlets very spiny, the spines branched, some once or twice bifurcating, slender, very pungent, yellow; leaves scarcely expanding, 3–4 mm. long, the petiole about one-third of the length, the leaflets mostly 4 pairs, nearly rotund, thick, densely white-woolly; pedicels half the length of the leaves, stout, thickened upward; calyx 3 mm. long, campanulate, the lobes subequal, broadly triangular-ovate, spreading; corolla white-pilose, the standard 6 mm. long and broad, long-clawed, variously blue or purple, with yellowish markings.

"On dry hillsides near Lake Titicaca, 12,600 ft., Aug. 28, 1901" (*No. 2418*).

Species, according to description, near to *P. patencana* (Ulbrich).

Meibomia rhynchosiifolia sp. nov.

Stems elongated, slender, ascending, purple, sulcate, clothed with divaricate, curved, yellow hairs; stipules 3 mm. long, triangular-ovate, attenuate, thin, brown, pilose; petioles 15–20 mm. long, stoutish; stipellæ as long as the stipules, linear, attenuate; leaflets broadly ovate, the terminal a little larger, 15–30 mm. long, acute, the base rounded; thickish, both surfaces white-pilose, the veins purple; panicle elongated, sparsely branched, loosely flowered, very pilose, the flowers mostly in pairs; bracts similar to stipules, caducous; pedicels about 8 mm. long, slender; calyx about 4 mm. long, brown-purple, the tube hemispherical or broader, the lobes acuminate, triangular; corolla 9–10 mm. long and about equaling the longer stamens, the free portions of the filaments about 1 mm. long, the stamen-column broad; pistil about as long as the stamens, or longer in some flowers; stipe longer than the fruiting calyx, pilose; pod about 5-jointed, the joints rhomboid-oval, the sutures nearly equally indented,

"Trailing on ground, the flowers purple; Apolo, 4800 ft., Feb. 27, 1902" (*No. 305*).

Machaerium latifolium sp. nov.

Glabrous; branchlets slender, gray, finely verrucose; leaves 10–20 cm. long, the petioles nearly a fourth of the total length; leaflets mostly 7–9; petiolules 3 mm. long, stout, mostly recurved; blades 3.5–7 cm. long, 2.5–4 cm. wide, ovate, ounded to subcordate at the base, acutish, thick, very dark green, slightly shining above, where the midrib is impressed, the venation slender, inconspicuous, coarsely reticulate; fruiting calyx 1.5 mm. long, nearly as broad, but little enlarged above, short-lobed; stipe very slender, 5 mm. long; lower portion of pod 15–18 mm. long, 7–10 mm. broad, slightly curved, oval, slightly contracted where it joins the wing, which is strongly falcate, 3–3.5 cm. long, 12–14 mm. wide at the middle portion, blunt, finely reticulate, the margin slightly and sharply thickened on both sides.

"Mychariapa, 3500 ft., Apr. 8, 1902" (*No. 246*).

The same collected by Pearce on the Coroico River at about 4000 ft. elevation.

Machaerium juglandifolium sp. nov.

Glabrate on the lower leaf-surfaces, very minutely puberulent; branchlets slender, flexuous, terete, gray, finely verrucose; leaves 17–25 cm. long, including the petioles, which are 4–5 cm. long; leaflets 6–7 pairs, very short petiolulate, 5–8 cm. long, 2–3 cm.

wide, lance-oblong, obtuse, rounded or subcordate at the base, thickish, the margin revolute, dark above, pale beneath, the venation finely reticulate, slightly prominent above, strongly so beneath, the secondaries 8–10 pairs; racemes short and few-flowered, short-peduncled; flowers sessile; fruiting calyx 2 mm. long and broad, campanulate, shallowly-lobed; stipe 4–6 mm. long, curved; pod 4–5 cm. long, 12–15 mm. wide, very slightly coarsely reticulate, the margin sharply thickened.

"A small tree; Tumupasa, 1800 ft., Jan. 6, 1902" (*No. 529*).

Machaerium jacarandifolium sp. nov.

Inflorescence, etc., ferruginous tomentose; branchlets blackish-purple, stout, the older portions having a gray, roughish bark, and armed with short, very stout, straight spines; stipules 3–4 mm. long, lance-ovate, acuminate, thin; leaves crowded, 10–15 cm. long, on very short petioles; leaflets 30–40, very shortly petiolulate, 8–15 mm. long, 2.5–5 mm. broad, oblong-lanceolate, the summit truncate or faintly retuse and mucronulate, oblique at the base, the margin revolute, thick, dark-green above, very pale beneath, with strong, terete, yellow mid-rib, the secondaries very numerous and strong, running almost straight into the thickened edge, at an angle of about 45 degrees; flowers not seen; stipe of the pod very short and stout; pod sigmoid, the straightish basal portion about 12 mm. long and 8 mm. broad, the remaining portion 30–35 mm. long, 12 mm. wide, the margin lightly thickened, the venation coarsely reticulate.

"Fifteen ft. high and 8 inches in diameter; Apolo, 4800 ft., July 18, 1902" (*No. 1436*). Probably the same as *Bang No. 2190*. It was collected by Pearce at Machariapu, 6000 ft., and "above Paquelin." The species is near *M. angustifolium* Vogel.

From Pearce's flowering specimen I take the following description: calyx cup-shaped, 3 mm. long, nearly as broad, the margin sinuately lobed; corolla deep-purple, smooth, the exserted portion about twice as long as the calyx.

Platymiscium ellipticum sp. nov.

Younger portions and lower leaf-surfaces minutely puberulent, the pods ferruginous-tomentose; branchlets short, stout, widely spreading, coarsely angled, purple, white-spotted; stipules not seen; leaves 7–10 cm. long, the petioles short, angled; leaflets alternate, nostly 6; petiolules 2 mm. long, stout, costate, the blades 2–5 cm. long, 10–25 mm. wide, ovate or oval, obtuse or minutely retuse and mucronulate, mostly rounded at the base, thick, the venation strongly prominent on both sides, the principal secondaries 10–12 pairs, alternating with others nearly as strong, spreading at a wide angle, the ends interarching; peduncles mostly

5–6 mm. long; pods mostly 4–6 cm. long, 15–20 mm. broad, inaequilaterally obovate, the summit rounded, abruptly contracted into a stipe about 3–4 mm. long, where the margin becomes gradually much thickened; seed about at the middle.

"A tree 30 ft. high and 10 inches in diameter. Tumupasa, 1800 ft., Dec. 15, 1901" (*No. 409*). The bark is gray and smoothish.

Bradburya cologanioides sp. nov.

Root woody, branching; stems very slender, flexuous, sulcate, the upper parts, peduncles etc., slightly pubescent, the hairs mostly reflexed, yellowish; stipules 3–4 mm. long, triangular-ovate, acute, sharply nerved; petioles about 2–2.5 cm. long; stipellae similar to stipules, but smaller; petiolules very short; leaflets subequal, the terminal a little larger, 3–4 cm. long, nearly half as broad, ovate, obtuse, mucronulate, the base broad and blunt, the lateral similar but slightly inaequilateral, all thick, rugose, sparsely pilose on the veins beneath, the 5 or 6 pairs of secondaries very prominent beneath and interarching close to the margin; peduncles axillary, 7–15 cm. long, as thick as the stems, mostly 2-flowered, the lower flower very short-pedicelled; bractlets similar to the stipules; calyx-tube saucer-shaped, 6–8 mm. broad, the lobes triangular-ovate or lanceolate, acuminate, the larger attenuate and about as long as the breadth of the tube; corolla when just ready to expand (but one seen) about 2 cm. long; pod (mature?) 8 cm. long, 5 mm. broad, attenuate and very acute.

"Apolo, 5000 ft., Apr. 9, 1902" (*No. 264*).

No. 47, from the same locality, Mar. 4, 1902, is a smaller plant, with much narrower leaves, approaching *B. angustifolia*, but I think it is the same. Its flowers are also smaller.

Dolicholus apoloensis sp. nov.

Pubescent; stems very slender, finely angled; stipules 3–4 mm. long, triangular-ovate, acute, 3–5-nerved; petioles 2.5–4 cm. long; petiolules of the lateral leaflets about 2 mm. long, of the terminal about 6–8 mm.; lateral leaflets 2–5 cm. long and nearly as broad, the lower half about twice as broad as the upper, the two forming a very broad rounded sinus; terminal leaflet of about the same size, obscurely sinuate, all acuminate and acute, thin, green, the venation slender and inconspicuous; racemes axillary, slightly exceeding their leaves; very long-peduncled; pedicels 2 mm. long; calyx-tube broadly campanulate, nearly as long as the pedicel, shorter than the longest lobe; calyx-lobes lanceolate, acuminate and acute, the smallest about half the size of the largest; corolla about 7 mm. long; ovary and base of style hirsute, the style much exceeding the petals and stamens, the stigma large; pod 15 mm. long, 7 mm. broad, obovoid, strongly compressed, dark-brown pilose, tipped by a style 3 mm. long, 2- or 3-seeded; seeds black, smooth, compressed, 4 mm. long, the sharp convexity of the hilum about half its length.

"Apolo, 4800 ft., Feb. 22, 1902" (*No. 97*).

No. 106, same locality, collected on the preceding day, the "Flowers yellowish," is a slightly more robust form of the same.

It seems to be the same as *Spruce No. 2208*, and was also collected by Sinclair on the Gulf of Fonseca.

Eriosema fusiformis sp. nov.

Pilose throughout with long, straightish white hairs, which arise, from minute papillae the latter imparting a scurfy appearance to the surface; stems from a stout conico-fusiform tuberous-thickened root, 10–20 cm. long, erect or ascending, thickish, very leafy, the leaves sessile, trifoliolate; stipules erect, 5–8 mm. long, 2–3 mm. broad, lanceolate, attenuate, brown, strongly nerved; lateral leaflets subsessile, almost equaling the terminal, which has a short, stout petiolule; blades 2–3 cm. long, 4–6 mm. broad, lanceolate, scarcely acute, thick, the midrib and 4–6 pairs of strongly ascending secondaries reddish, prominent underneath, the margin thickened, revolute. Flowers not seen. Very young fruit sessile and concealed by the erect-appressed upper leaves.

"Prairies, Apolo, Mar. 4, 1902" (*No. 29*).

Bang No. 427 pp., called "*427a*," from Yungas, 1890, published as *E. crinita*, is the same.

Eriosema sp. nov.?

Pilose throughout with long ferruginous hairs with thickened bases; stems from a stout, woody, vertical, connico-fusiform tuberous-thickened root, 7–15 cm. long, erect, subsimple, very leafy; stipules 8–10 mm. long, 2–4 mm. wide, finely attenuate from the base, brown, thickish, strongly nerved; petioles 2–4 mm. long, the lateral petiolules a little shorter, the terminal a little longer; leaflets uniform, the lateral about two-thirds to three-fourths the length of the terminal, linear to linear-lanceolate or linear-oblanceolate, 3–6 cm. long, 4–6 mm. broad, acute; venation finely reticulate, prominent both sides, especially underneath, the secondaries very irregular in number and appearance, the lower nearly erect, the upper, or sometimes all, interarching near the margin. Expanded flowers not seen. Corolla in the bud reddish-purple; pedicel very short and stout; calyx-tube cupulate, about 4 mm. broad and 2 or 3 mm. high, the lobes triangular, attenuate, the lowest very finely so and 4 or 5 mm. long; capsule about 12–14 mm. long, two-thirds as broad, oval, mucronate, brown.

"Apolo, Mar. 8, 1902" (*No. 9*).

No. 117, "hills near Apolo, 6000 ft., Feb. 20, 1902," seems to be a glabrate form of the same.

This may be merely a variety of the last, though its closely sessile leaves, with different reticulation, and its quite distinct general appearance, seem to mark it as different. It remains to be determined whether the *crinita* group represents one widely varying species, or a group of closely related species.

GENERAL INDEX

Abrams, Le Roy. A Phytogeographic and Taxonomic Study of the Southern California Trees and Shrubs . . . 300
Accessions . . . 37, 148
Accountant. Report for 1907 . . . 103
  Report for 1908 . . . 201
Administrative . . . 19, 135
American Desert Plants . . . 33, 190
Annual Members, for 1907 . . . 90
  for 1908 . . . 211
Arboretum. Deciduous . . . 29, 187
Arrangement of the Herbarium . . . 39
Arrests . . . 23, 81, 139, 199
Assistance and Investigations . . . 39, 150
Assistant Director. Report for 1908 . . . 137
Assistant, First. Report for 1907 . . . 22
Auditor, Special. Report for 1907 . . . 114
  Report for 1908 . . . 226

Barnhart, John Hendley. Report of the Librarian, for 1907 . . . 51
  Report of the Librarian, for 1908 . . . 164
Benefactors, for 1907 . . . 87
  for 1908 . . . 208
Blacksmith . . . 197
Bolivia, New Species from, Collected by R. S. Williams—I . . . 487
Bolivian Mosses, Part II . . . 227
Boundary Fences . . . 8, 121
Bridges . . . 3, 119
Britton, N. L. Report of the Secretary and Director-in-Chief, for 1907. 1
  Report of the Secretary and Director-in-Chief, for 1908 . . . 115
Building of Paths . . . 77
Buildings . . . 7, 23, 80, 120, 139
Bulletin . . . 24, 140

California Trees and Shrubs, Southern. A Phytogeographic and Taxonomic Study of . . . 300
Carpenters . . . 197
Collections. Miscellaneous . . . 32, 189
  Systematic . . . 29
Committee on Patrons, Fellows, and Members. Report for 1907 . . . 87
  Report for 1908 . . . 208
Conservatories . . . 23, 30, 139, 187
Conservatory Flower Garden . . . 33, 190
  Lily Pools . . . 33, 190
Conserving of Specimens. Mounting and . . . 38
Considerations. Financial . . . 135
  General . . . 20
Construction of Driveways . . . 195
  of Roads . . . 77
  of Roads and Paths . . . 2, 118
Contributions . . . 24, 141
Contributors to Exploration Fund, for 1907 . . . 15

Contributions for 1908. 131
  to Special Fund for Increase of the Collections, for 1908. 125
  to Special Fund for Scientific and Educational Work, for 1908. 124
Cox, C. F. Report of the Treasurer, for 1907. 111
  Report of the Treasurer, for 1908. 223
Critical Notes on New or Little Known Species in the Herbarium of the New York Botanical Garden. 262
Curator of the Economic Collections, Honorary. Report for 1907 74
  Report for 1908. 153
Curator of the Museums and Herbarium, Head. Report for 1907. 37
  Report for 1908. 148

Deciduous Arboretum 29, 187
Demonstrations. Lectures and. 14
Desert Plants. American 33, 190
Director-in-Chief, Secretary and. Report for 1907. 1
  Report for 1908 115
Director of the Laboratories. Report for 1907. 42
  Report for 1908. 157
Drainage 5, 79, 116, 196
  Grading and. 116
Driveways. Construction of. 195

Economic Garden 32, 189
  Museum. 38
Equipments. Stable, Horses and. 199
Expenditures During 1907. Schedule of. 103
  During 1908. Schedule of. 201
Exploration 15, 131

Fellows for Life, for 1907. 88
  for 1908. 209
Fellowship Members, for 1907 90
  for 1908. 211
Fences. Boundary 8, 121
Financial Considerations. 135
First Assistant. Report for 1907. 22
Flora. North American 25, 142
Flower Garden. Conservatory 33, 190
Fossil Plant Museum. 38
Fruticetum 29, 187

Gager, C. Stuart. Report of the Director of the Laboratories for 1907. . . . 42
Garden. Conservatory Flower 33, 190
  Economic 32, 189
  Morphological 32, 189
Gardener, Head. Report for 1907. 29
  Report for 1908. 187
General Considerations. 20
  Horticultural Operations. 34, 190
Grading. 4, 78, 116, 196
  and Drainage. 116
  Regulating and. 78, 196
Groesbeck, Walter S. Report of the Accountant, for 1907. 103
  Report of the Accountant, for 1908. 201
Grounds. 22, 29, 137, 187
  Herbaceous 29, 187
Grove. The Hemlock. 10, 122
Guides and Guide-Books 14, 130

Head Curator of the Museums and Herbarium. Report for 1907...... 37
  Report for 1908.......... 148
Head Gardener. Report for 1907.......... 29
  Report for 1908.......... 187
Heating and Power Plant..........24, 140
Hemlock Grove. The..........10, 122
Herbaceous Grounds..........29, 187
Herbaria.......... 149
Herbarium..........11, 31, 38, 39, 124, 188
  Arrangement of the.......... 39
  Labeling, Recording and..........31, 188
Hochreutiner, B. P. G. Critical Notes on New or Little Known Species in the Herbarium of the New York Botanical Garden.......... 262
Honorary Curator of the Economic Collections. Report for 1907...... 74
  Report for 1908.......... 153
Horses and Equipment. Stables.......... 199
Horticultural Operations. General..........34, 190

Investigations..........17, 35, 39, 133, 145, 150, 193
  Assistance and..........39, 150
  Personal.......... 145
Investigators and Students, during 1907.......... 46
  during 1908.......... 160

Journal..........24, 140

Labeling..........31, 38, 188
  Recording and Herbarium..........31, 188
Labels. Descriptive.......... 155
  Ordinary Specimen.......... 154
Laboratories..........13, 129
Lectures. Public..........26, 142
  School..........27, 143
  and Demonstrations..........14, 130
Librarian. Report for 1907.......... 51
  Report for 1908.......... 164
Library..........12, 125
Life Members, for 1907.......... 88
  for 1908.......... 209
Lily Pools. Conservatory..........33, 190
Lists:
  Annual Members, for 1907.......... 90
    for 1908.......... 211
  Benefactors, for 1907.......... 87
    for 1908.......... 208
  Contributors to Exploration Fund, for 1907.......... 15
    for 1908.......... 131
    to Special Fund for Increase of the Collections, for 1908.......... 125
    to Special Fund for Scientific and Educational Work, 1908.......... 124
  Fellows for Life, for 1907.......... 88
    for 1908.......... 209
  Fellowship Members, for 1907.......... 90
    for 1908.......... 211
  Investigators and Students, during 1907.......... 46
    during 1908.......... 160
  Lectures, during 1907.......... 26
    during 1908.......... 142
  Life Members, for 1907.......... 88
    for 1908.......... 209
  Number of Plants in the Several Conservatory Houses, for 1907...... 30
    for 1908.......... 188

Lists:
  Number of Species and Varieties of Plants in the Several Collections, for 1907 32
    for 1908 189
  Number and Distribution of Show Labels Made, during 1907 31
    during 1908 188
  Number and Sources of Accessions, for 1907 37
    for 1908 148
  Patrons, for 1907 87
    for 1908 208
  Periodicals Received, in 1907 52
    in 1908 164
  Publications Issued, in 1907 24
    in 1908 140
  Scientific Meetings, 1907 27
    in 1908 144
  Sustaining Members, for 1907 90
    for 1908 211

Masons. Stone 198
Mechanics. Work Performed by 197
Meetings. Scientific 27, 144
Members. Annual, for 1907 90
    for 1908 211
  Fellowship, for 1907 90
    for 1908 211
  Life, for 1907 88
    for 1908 209
  Sustaining, for 1907 90
    for 1908 211
Merrill, J. L. Report of Special Auditor, for 1907 114
  Report of Special Auditor, for 1908 226
Miscellaneous Collections 32, 189
Morphological Garden 32, 189
Mounting and Conserving of Specimens 38
Murrill, W. A. Report of the Assistant Director, for 1908 137
  Report of the First Assistant, for 1907 22
Museum 23, 139
  Economic 38
  Fossil Plant 38
  Systematic 38
Museums 11, 37, 123, 148

Nash, George V. Report of the Head Gardener, for 1907 29
  Report of the Head Gardener, for 1908 187
Native Plants. Preservation of 19, 134
New Species from Bolivia, Collected by R. S. Williams—I 487
North American Flora 25, 142
Nurseries. Propagating Houses and 30, 188

Operations. General Horticultural 34, 190

Painters 198
Paths 2, 77, 118, 195
  Building of 77
  Roads and. Construction of 2, 118
Patrons, for 1907 87
  for 1908 208
Periodicals received, in 1907 52
  in 1908 164

Personal Investigations.. 145
Phytogeographic and Taxonomic Study of the Southern California Trees
  and Shrubs. A.. 300
Pinetum..29, 187
Plantations. Systematic.. 187
Plant. Heating and Power.. 24
Plants. American Desert..33, 190
  and Planting..9, 122
  Native. Preservation of..19, 134
Plumbers.. 199
Police Protection.. 134
Pools. Conservatory Lily..33, 190
Power Plant. Heating and..24, 140
Preservation of Native Plants..19, 134
Propagating Houses and Nurseries..30, 188
Protection. Police.. 134
Publications..24, 140
Public Lectures..26, 142

Recording and Herbarium. Labeling..31, 188
Regulating and Grading..78, 196
Reports:
  Accountant, for 1907.. 103
    for 1908.. 201
  Assistant Director, for 1908.. 137
  Chairman of the Board of Scientific Directors, for 1907.. 82
  Committee on Patrons, Fellows, and Members, for 1907.. 87
    for 1908.. 208
  Director of the Laboratories, for 1907.. 42
    for 1908.. 157
  First Assistant, for 1907.. 22
  Head Curator of the Museums and Herbarium, for 1907.. 37
    for 1908.. 148
  Head Gardener, for 1907.. 29
    for 1908.. 187
  Honorary Curator of the Economic Collections, for 1907.. 74
    for 1908.. 153
  Librarian, for 1907.. 51
    for 1908.. 164
  Secretary and Director-in-Chief, for 1907.. 1
    for 1908.. 115
  Special Auditor, for 1907.. 114
    for 1908.. 226
  Superintendent of Grounds, for 1907.. 74
    for 1908.. 195
  Treasurer, for 1907.. 111
    for 1908.. 223
Research Scholarships..17, 133
Roads..2, 77, 118
  and Paths. Construction of..2, 118
  Construction of.. 77
Rusby, H. H. New Species from Bolivia, Collected by R. S. Williams—I 487
  Report of the Chairman of the Board of Scientific Directors, for 1907 82
  Report of the Honorary Curator of the Economic Collections, for 1907 74
  Report of the Honorary Curator of the Economic Collections, for 1908 153

Salicetum..29, 187
Schedule of Expenditures, during 1907.. 103
  during 1908.. 201
Schilling, F. A. Report of the Superintendent of Grounds, for 1907.... 77
  Report of the Superintendent of Grounds, for 1908.. 195

Scholarships. Research.....17, 133
School Lectures.....27, 143
Scientific Directors. Report of the Chairman, for 1907..... 82
  Meetings.....27, 144
Secretary and Director-in-Chief. Report for 1907..... 1
  Report for 1908..... 115
Small, J. K. Report of the Head Curator of the Museums and Herbarium, for 1907..... 37
  Report of the Head Curator of the Museums and Herbarium, for 1908 148
Special Auditor. Report for 1907..... 114
  Report for 1908..... 226
Stable.....24, 140, 199
  Horses and Equipment..... 199
Stone Masons..... 198
Students and Investigators, during 1907..... 46
  during 1908..... 160
Sustaining Members, for 1907..... 90
  for 1908..... 211
Systematic Collections..... 29
  Museum..... 38
  Plantations..... 187

Telephone Extension..... 80
  Service.....8, 121
Treasurer. Report for 1907..... 111
  Report for 1908..... 223

Viticetum..... 187

Water Supply.....6, 78, 119
Williams, R. S. Bolivian Mosses, Part II..... 227
  New Species from Bolivia, Collected by..... 487
Work Performed by Mechanics..... 197

GENERIC INDEX

Abelia, 29
Abies, 309, 311, 323, 329
Acacia, 274, 322, 385
Acalypha, 319, 399
Acamhiacyris, 321
Acampe, 270
Acamptopappus, 321, 462, 466, 471
Acer, 312, 316, 317
Acidodontium, 230
Acrocryphaea, 237
Actinostemon, 278
Adelia, 320, 435, 437
Adelothecium, 245
Adenostoma, 314, 316, 317, 320, 372, 377, 378
Adolphia, 319, 404, 415
Aeschynomene, 511
Aesculus, 318
Agave, 321
Alabastra, 141
Albugo, 25
Allenrolfea, 321, 353, 356
Alnus, 317, 322, 342
Amelanchier, 381, 382
Amorpha, 389, 393, 394
Amygdalus, 320, 321, 382, 384, 385
Anacamptodon, 244
Anatherum, 262
Andropogon, 262, 264
Anomanthodia, 290
Anomobryum, 230, 231
Anonymos, 283
Antennaria, 308
Antrophyum, 25
Aplopappus, 467, 469, 470, 471, 474
Apocopis, 262
Arbutus, 315, 430, 433
Archytaea, 274
Arctostaphylos, 431, 432, 433, 434
Arenaria, 308
Aristolochia, 501, 502
Arrhostoxylum, 287
Artemisia, 311, 321, 462, 480, 481, 482
Arundina, 270
Asagraea, 397, 491
Aster, 469, 470, 472
Atriplex, 313, 314, 315, 319, 320, 321, 353, 354, 355
Audibertia, 443, 444, 445, 446
Aytonia, 25
Azalea, 311, 429, 430
Baccharis, 292, 293, 314, 316, 321, 322, 462, 474, 475, 476
Banisteria, 277, 278
Bartramia, 233
Bassovia, 285
Batis, 315, 357
Bebbia, 319, 321, 462, 477, 478
Beloperone, 322, 454
Berberis, 359, 360
Bergerocactus, 421, 427
Bernardia, 399
Bigelovia, 468, 469, 471, 472, 473
Bignonia, 454
Blakea, 281
Bletia, 270
Bomarea, 265, 266
Brachymenium, 230
Brachythecium, 258
Bradburya, 515
Breutelia, 234, 235
Brickellia, 463, 464, 465
Bryanthus, 430
Bryum, 229, 231, 232
Bulbophyllum, 269
Bulbostylis, 292, 464
Byrsonima, 277

Calathea, 495, 496
Calea, 298, 299
Callicostella, 246
Calliergon, 259
Calligonum, 355
Campylodontium, 242
Campylopodium, 261
Campylopus, 40, 261
Caprifolium, 457, 458, 459
Capsicum, 285
Carex, 308
Carnegiea, 421, 427
Carphephorus, 477
Castanea, 349
Castanopsis, 311, 342, 349
Catherinia, 235
Catopsis, 489
Ceanothus, 310, 311, 312, 313, 314, 315, 316, 317, 318, 320, 404, 408, 409, 410, 411, 412, 413, 414, 415
Cecropia, 498
Celtis, 497
Cenchrus, 262
Centotheca, 262
Cerasus, 382, 383, 384

Cercidium, 322, 387, 388
Cercis, 311, 387
Cercocarpus, 311, 320, 372, 375, 376
Cereus, 423, 427
Cerophyllum, 366
Chamaebatia, 373, 379
Chamaecerasus, 459
Charpentiera, 291
Cheiranthus, 315
Chenopodium, 356
Chilopsis, 319, 320, 454
Chiranthodendron, 419
Chrysoma, 468, 469, 470, 472
Chrysothamnus, 311, 321, 462, 471, 472, 473
Cipura, 493
Cleistoyucca, 320, 323, 334, 335
Clematis, 313, 358
Cleome, 363
Cneoridium, 319, 398
Coleogyne, 321, 372, 378
Coleosanthus, 321, 322, 461, 463, 464, 465
Comarostaphylis, 320, 430, 431
Commelina, 490, 491
Condalia, 322, 404, 405
Cornus, 311, 429
Covillea, 320, 321, 323, 397
Cowania, 321, 372, 375
Crataegus, 134, 161, 381
Crossosoma, 371, 372
Cruikshanksia, 269
Cryphaea, 237, 238
Cudrania, 271
Cudranus, 271
Cupressus, 330
Cyclodictyon, 245, 246
Cynoctonum, 282, 284
Cynometra, 275
Cynoxylon, 428, 429
Cyphomandra, 285, 286

Dactylostemon, 278
Dalea, 395, 396, 397
Daltonia, 245
Daphnidostaphylos, 432
Dendromecon, 361, 362
Dianthera, 287, 288
Dicranella, 261
Diervilla, 29
Dimorphandra, 274
Dioscorea, 267, 268, 269, 492
Diotis, 356
Diplacus, 314, 318, 451, 453, 454
Diplopappus, 470
Distegia, 459
Dolicholus, 515
Dondia, 353, 357
Drosera, 49, 144, 163

Echinocactus, 320, 421, 425, 426, 427
Ectropothecium, 255, 256
Emplectocladus, 384
Encelia, 319, 321, 322, 462, 478, 479, 480
Endotropis, 406
Entodon, 242
Ephedra, 318, 319, 320, 332, 333
Epidendrum, 269
Ericameria, 314, 317, 319, 321, 322, 462, 468, 469, 470, 471
Eriodictyon, 311, 313, 439, 440, 441
Eriogonum, 313, 314, 315, 316, 318, 320, 349, 350, 351, 352
Eriosema, 516
Ernodea, 141
Erythrodontium, 243
Eudioscorea, 268
Eugenia, 280
Euhymenocallis, 265
Eulophia, 270
Eupatorium, 292
Euphorbia, 278, 400
Euphrasia, 287
Eurhynchium, 258
Eurotia, 321, 353, 356
Exogonium, 141

Fabronia, 243, 244
Fallugia, 321, 372, 374
Ficus, 498
Floribundaria, 240
Floscopa, 490
Forestiera, 437
Fouquiera, 322, 420
Frangula, 406
Frankenia, 420
Franseria, 460, 461
Fraxinus, 318, 435, 436
Fremontia, 357, 419
Fremontodendron, 318, 419

Gaertneria, 319, 320, 321, 322, 459, 460, 461
Garrya, 428
Gilia, 438, 439
Gnaphalium, 293, 294
Gomphrena, 502
Grayia, 320, 321, 353, 356
Grimmia, 260
Grossularia, 313, 314, 315, 318, 365, 368, 369, 370, 371
Guatteria, 504
Gutierrezia, 319, 321, 322, 461, 463, 466
Gymnosiphon, 496
Gynopachys, 290

Halostachys, 356

Haplodontium, 229
Harpalium, 295
Harpidium, 258
Hazardia, 462, 474
Hedwigia, 236
Hedwigidium, 236
Heisteria, 271, 272
Helianthemum, 420, 421
Helianthus, 296, 297
Helichrysum, 293, 294
Helicodontium, 244, 245
Heliconia, 494, 495
Helmia, 268, 269
Hesperoyucca, 333, 334
Heteromeles, 381
Heteropsis, 493
Heteropteris, 277, 278
Hevea, 155
Heyderia, 311, 330
Hibiscus, 416, 419
Hippeastrum, 491, 492
Hiraea, 276, 277
Hofmeisteria, 321, 461, 462
Holodiscus, 373
Hookeriopsis, 246, 247
Hosackia, 392, 393
Hygrohypnum, 258
Hymenocallis, 265
Hymenoclea, 319, 320, 459, 460
Hypericum, 274
Hypopterygium, 248

Ibervillea, 141
Ilex, 35
Inyonia, 483
Ischaemum, 262
Isomeris, 318, 319, 321, 363, 364
Isopterygium, 256
Iva, 319
Ixora, 290, 291

Jacobina, 454
Juglans, 313, 315, 341, 497
Juniperus, 311, 317, 318, 322, 330, 331, 332
Justicia, 287

Krameria, 321, 322, 388
Kunzia, 318, 321, 372, 378

Lagascea, 294
Lamarouxia, 287
Lasiogyne, 268
Laurocerasus, 382, 384, 406
Lavatera, 416
Lebeckia, 275, 276
Leiomela, 233
Lepidium, 321, 363
Lepidopilum, 248
Lepidospartum, 319, 321, 462, 482
Leptobryum, 229
Leptodactylon, 311, 313, 438, 439
Leskea, 249
Libocedrus, 330
Licanea, 273
Limodorum, 270
Lindigia, 240
Linosyris, 469, 471, 472, 473, 482
Lipochaeta, 297, 298
Lithraea, 316, 400, 403
Litsaea, 272
Lonicera, 314, 316, 455, 457, 458, 459
Loranthus, 271
Lotus, 392, 393
Lupinus, 314, 315, 317, 389, 390, 391, 510
Lycium, 319, 320, 447, 448, 449, 450
Lyonothamnus, 372, 373

Machaerium, 413, 414
Maclura, 271
Macromitrium, 40
Macrosolen, 271
Mahonia, 359, 360
Malacothamnus, 313, 315, 318, 416, 417, 418, 419
Malanea, 289, 290
Malpighia, 277
Malva, 417, 418
Malvastrum, 417, 418, 419
Meibomia, 413
Meiothecium, 251, 252
Menodora, 320, 435, 437
Meteoriopsis, 240, 241
Meteorium, 240
Microthamnium, 254, 255
Mielichhoferia, 227, 228
Mimosa, 274
Mimulus, 453, 454
Mitreola, 282, 283, 284
Mniobryum, 230
Mnium, 232
Mogiphanes, 503
Monstera, 494
Myrica, 315, 316, 341
Myriocarpa, 500

Nama, 441
Neckera, 241, 242, 251
Nectandra, 507, 508
Nelitris, 280
Neomeris, 150
Neostyphonia, 400, 402, 403
Neowashingtonia, 322, 333
Nicotiana, 447, 450
Nolina, 322, 333, 334
Notelaea, 284

Obione, 353, 354, 355
Ocotea, 506, 507
Odostemon, 313, 318, 359, 360
Oenothera, 43, 45
Olneya, 323, 389, 397
Ophiorrhiza, 282, 283, 284
Opuntia, 319, 321, 421, 422, 423, 424, 425
Oreodaphne, 361
Orthodontium, 229
Orthostichidium, 238
Orthostichopsis, 239
Osmanthus, 284, 285
Oxyria, 308
Oxysepala, 269

Padus, 382, 383
Papillaria, 240
Parkinsonia, 322, 387, 388
Parosela, 321, 322, 389, 394, 395, 396, 397, 511
Pasania, 342
Patigonium, 512, 513
Pavetta, 291
Pentstemon, 311, 314, 317, 451, 452, 453
Perfonon, 406
Persea, 505, 506
Peucephyllum, 321, 426, 483
Pfaffia, 502
Phalaris, 262
Philadelphus, 364
Philonotis, 233, 234
Philotria, 141
Phlox, 439
Phoradendron, 501
Photinia, 381
Phthirusa, 500, 501
Phyllodoce, 309, 429, 430
Phyllogonium, 241
Picea, 329
Pickeringia, 389
Picrothamnus, 462, 480
Pilocereus, 427
Pilotrichella, 239
Pinus, 308, 309, 310, 311, 317, 318, 320, 322, 323, 324, 325, 326, 327, 328
Piptadenia, 274
Pirea, 238
Pitavia, 398
Pitcairnia, 263, 264, 488, 489
Pithecoctenium, 287
Plagiobryum, 261
Plagiothecium, 256, 257
Platanus, 317, 371
Platymiscium, 514
Ploiarium, 274
Pluchea, 321, 462, 477
Poa, 262
Pogonatum, 235, 236
Pohlia, 229
Polanisia, 272, 273
Polygala, 316, 398
Polypappus, 477
Polytrichadelphus, 235
Polytrichum, 236
Populus, 309, 310, 319, 320, 335, 336, 337
Porotrichum, 242
Potamium, 250, 251
Potamogeton, 35, 138, 193
Pourouma, 498
Prionodon, 238
Pritchardia, 333
Prosopis, 319, 321, 322, 385, 386
Prostanthera, 285
Prunus, 383, 384, 385
Psathyrotes, 483
Pseudocampylopus, 261
Pseudocryphaea, 237
Pseudoleskea, 249
Pseudotsuga, 313, 317, 322, 323, 329
Psidium, 279
Psilopilum, 235
Psychotria, 288, 289
Pterigynandrum, 251
Pterobryopsis, 238
Pterobryum, 238
Pterogoniella, 251, 256
Pterogonium, 251
Purshia, 378
Puya, 489

Quercus, 311, 315, 316, 317, 318, 342, 343, 344, 345, 346, 347, 348, 349

Raimannia, 48
Ramona, 311, 315, 316, 320, 322, 441, 443, 444, 445, 446
Randia, 290
Ranunculus, 308
Rhacocarpus, 237
Rhacopilum, 249
Rhamnus, 314, 318, 404, 405, 406, 407, 415
Rhegmatodon, 249
Rhizogonium, 233
Rhizophora, 18
Rhodobryum, 232
Rhododendron, 430
Rhus, 401, 402, 403
Rhynchostegium, 257, 258
Rhytidophyllum, 18
Rhytiglossa, 287
Ribes, 309, 311, 313, 317, 365, 366, 367, 368, 369, 370, 371
Ricinella, 399

Ricinus, 399
Rigodium, 250
Robsonia, 371
Romneya, 362
Rosa, 314, 373, 379, 380, 381, 509
Rubacer, 311, 372, 374
Rubus, 151, 311, 372, 374
Ruellia, 287

Sabina, 331
Saccolabium, 270
Salazania, 320, 441, 442
Salicornia, 315
Salix, 309, 311, 319, 320, 335, 337, 338, 339, 340
Salvia, 444, 445, 446
Sambucus, 29, 311, 455, 456
Sarcobatus, 321, 353, 357
Sarcophyllum, 275, 276
Sarracenia, 49, 141, 163
Sauloma, 251
Schmaltzia, 400, 401, 402
Schwetschkea, 244
Scilla, 264, 265
Scleria, 263
Scorpidium, 259
Sematophyllum, 252, 253, 254
Senecio, 299, 316, 462, 485
Sericographis, 454
Sericotheca, 309, 315, 372, 373
Sieversia, 374
Siliquastrum, 387
Simmondsia, 319, 400
Simsia, 479
Sisyrinchium, 269, 493
Solanum, 447, 448
Solenomelus, 269
Spergularia, 504
Sphacele, 314, 441, 443
Sphaerostigma, 315
Sphagnum, 260
Spiraea, 373
Spirostachys, 356
Squamidium, 239
Stableria, 229
Stenophyllidium, 268
Stenotopsis, 318, 321, 462, 467
Stenotus, 467
Stereophyllum, 243
Strombocarpus, 319, 321, 386
Stryphnodendron, 274
Stylidium, 292
Styphonia, 402
Styrax, 313, 434
Sueda, 357
Svida, 428, 429
Symbopetalum, 505
Symphoricarpus, 29, 311, 455, 456, 457
Syrmatium, 389, 392, 393
Syzygium, 279

Taxithelium, 252
Tessaria, 477
Tetradymia, 311, 319, 320, 321, 462, 482, 483, 484
Tetranthera, 361
Thamnosma, 321, 398
Thuidium, 249, 250
Tillandsia, 489
Tissa, 503
Topobea, 282
Toxicodendron, 400, 401
Tricherostigma, 319, 399, 400
Trichostelium, 252
Trichostema, 314, 315, 317, 441, 442
Trophis, 271
Turmionella, 471
Tyria, 399

Umbellularia, 317, 361
Urostigma, 499, 500
Uva-ursi, 311, 317, 430, 431, 432, 433, 434

Vellozia, 267
Ventenatia, 292
Vernonia, 292
Vetiveria, 262, 263
Viburnum, 29
Victoria, 33, 190
Viguiera, 294, 295, 297, 319, 321, 362, 478
Vitis, 313, 416

Washingtonia, 333
Wedelia, 298
Weigela, 29
Weinmannia, 508, 509
Witheringia, 285

Xanthocephalum, 466
Xerobotrys, 433
Xylococcus, 320, 430, 431
Xylosteum, 459
Xylothermia, 314, 317, 389

Yucca, 319, 320, 334, 335

Zea, 25, 154
Zizyphus, 404, 405
Zygophyllum, 397

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